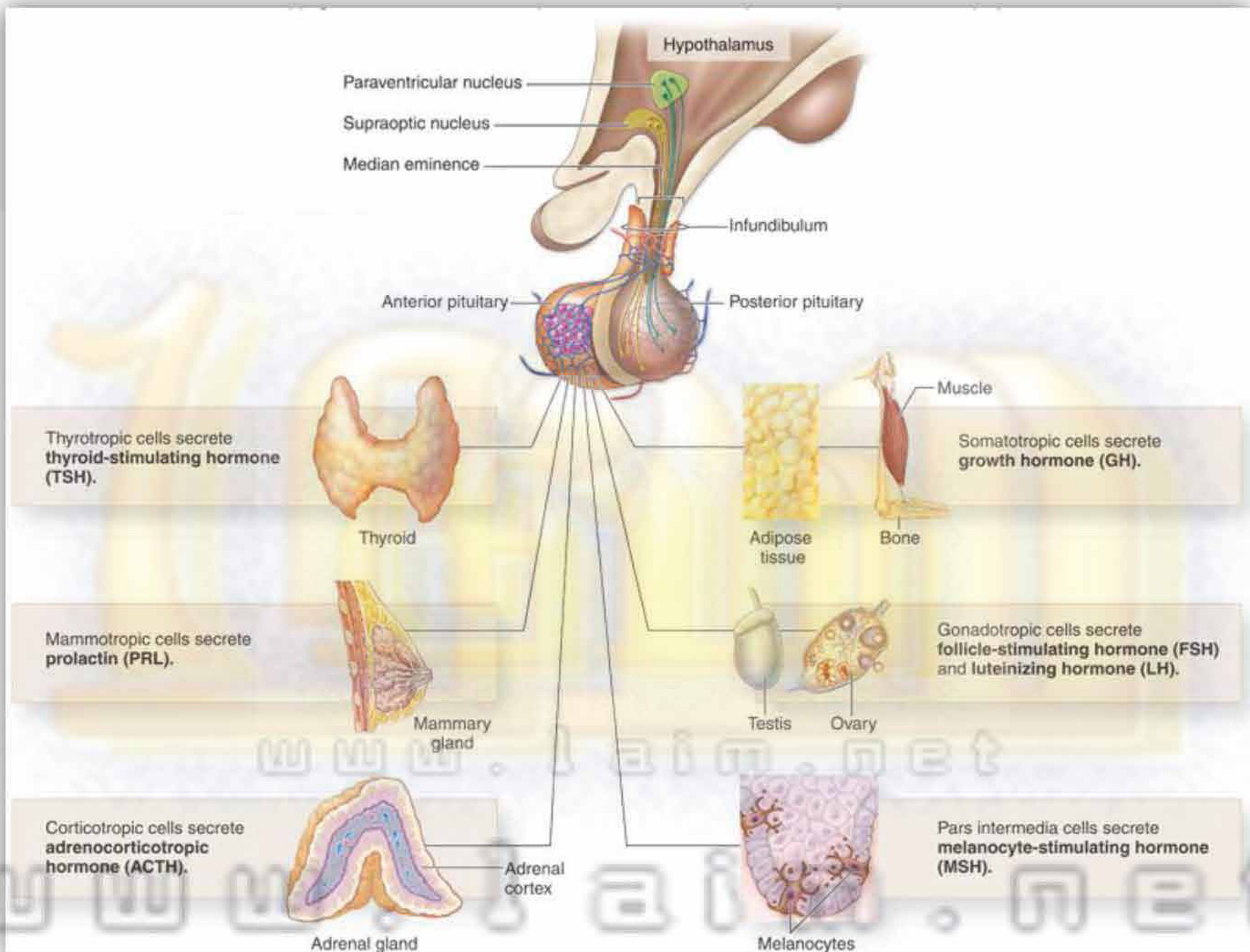


# ENDOCRINE



2 0 0 9 - 2 0 1 0

## INDEX:

### PITUITARY GLAND:

- **ACROMEGALY.**
- **DIABETES INSIPIDUS.**
- **SIADH.**
- **PAN-HYPO-PITUITARISM.**

### ADRENAL GLAND:

- **ADDISON'S DISEASES.**
- **CONN'S \$**
- **CUSHING \$.**
- **PHEOCHROMOCYTOMA.**

### THYROID GLAND:

- **GRAVE'S D.**
- **MYXEDEMA**

### PARA-THYROID GLAND:

- **HYPER-PARATHYROID.**
- **HYPO-PARATHYROID.**
- **TETANY.**

### DIABETES MELLITUS.



VISIT...

LANZAROTE  
*Caliente*.COM



## DD of Tall Stature:

- 1) Hypogonadism.
- 2) Familial.
- 3) Marfan S.
- 4) Racial.
- 5) Klinefelter's S.
- 6) Cerebral Gigantism. (Sotos S)

# PITUITARY GLAND

## Ant. pituitary

## Post. pituitary

↑ GH

↑ Prolactin

↓ ADH

↑ ADH

CHILD

"pituitary hyper-plasia"

ADULT

"pituitary Adenoma"

GIGANTISM

ACROMEGALY

hyper-prolactinemia

FEMALES

MALES

DI

SIADH

Water Diuresis  
"poly-uria"

Water Intoxication

OVER-GROWTH of Skeleton & Soft T.

- Tall Stature > 190 cm.
- Too Strong / Intelligent / Sexual precocity.
- "Acromegaly in late life"

AMENORRHEA-  
Galactorrhea \$  
Sub-fertility.

IMPOTENCE  
loss of libido

↓ Urine ↑ plasma  
Osmolarity.

Dilutional Hyponatremia  
↑ Urine ↓ plasma Osmolarity

## GH

## HYPER-PROLACTINEMIA

## SIADH

### INVEST.

### TREATMENT

IMAGING

LAB

MEDICAL

"Only given till Surgery"

SURGERY

"of Choice"

Dopamin  
Agonist

Bromocriptin

Somatostatin  
Analogue

Octerotide

Trans-  
sphenoidal

Radioth.  
"Recurrence  
/ Sterilization"

1) phys.

LACTATION – pregnancy – STRESS.

2) Tumor

PREVENTING (-) stimuli from hypoth.

3) Metabolic

1<sup>st</sup> Hypo-Thyroidism (↑TSH → ↑TRH → prolactin)  
CRF dt ↓ excretion.

4) Drugs

phenoth. / Metoclopramide / Haloperidol.

1) Old = Br. Carcinoma.  
(para-malignant \$ of Small CC)

2) Young = TB – Sarcoid –  
Legionella.

3) HIV – Lymphoma.

### INVEST.:

- 1) ↓ NA & Osmolarity.
- 2) Urine Osmolarity > plasma

### TREATMENT:

- 1) Water restriction.
- 2) Democlocyclin.  
(↓ sensitivity of kidney tubules to ADH)

### INVEST

- 1) ↑ S. Prolactin.
- 2) CT / MRI on sella turcica.

### TREATMENT:

- 1) Dopamine ⊕ → Bromocriptine. (Parlodel)
- 2) Surgery. (Transphenoidal)

### PROGNOSIS:

- 1) Tissue & Sk. Changes are permanent even after surgery.
- 2) DM dt exhausted pancreas

X-Ray

CT / MRI  
on pituitary

1) Skull → widening of sella  
turcica + ↑ PNS.

2) Hands → Tuffing of T.  
phalanges (mushroom app.)

3) Heel → ↑ thickness of  
heel pad.

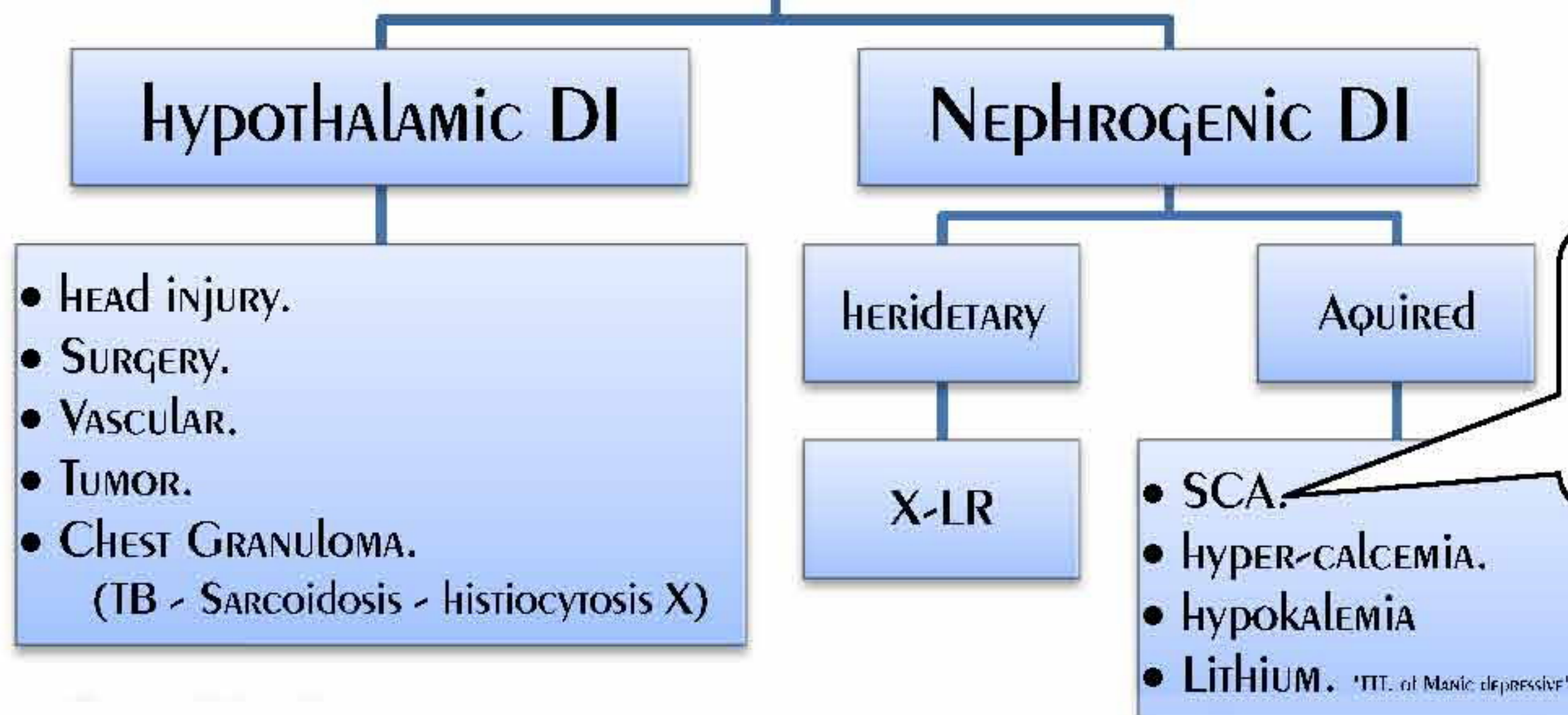


# ACROMEGALY

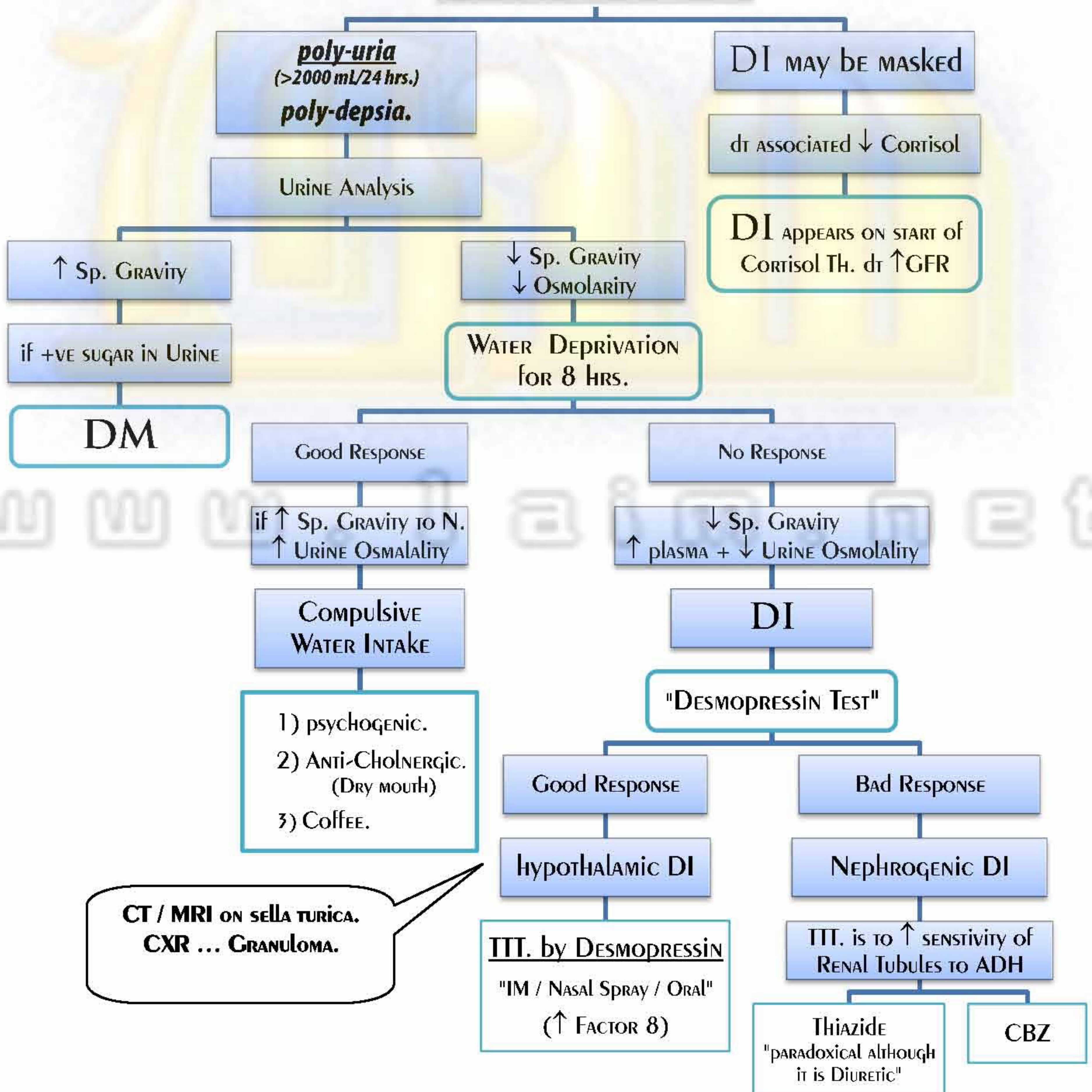
|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) <b>Facies</b>                   | <p><u>Ape like... (Old photographs):</u></p> <ul style="list-style-type: none"> <li>• <b>Big skull.</b></li> <li>• <b>Prominent supra-orbital ridge.</b></li> <li>• <b>EAR + NOSE ++ dt cartilaginous ++.</b></li> <li>• <b>Prognathism</b> → wide separated teeth + large tongue.</li> </ul>                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 2) <b>Hand – feet &amp; Joints</b> | <ul style="list-style-type: none"> <li>• <b>Hand &amp; feet ++</b> → <b>Spade hands.</b></li> <li>• <b>OA + Crepitus</b> in knee joints.</li> </ul>                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 3) <b>Viscera</b>                  | <p><b>HSM + Cardiomegaly + ↑ lung size.</b></p>                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 4) <b>Endocrinal</b>               | <ul style="list-style-type: none"> <li>• <b>↑ prolactin</b> → (-) FSH / LH → <b>Infertility &amp; Impotence.</b></li> <li>• <b>DM</b> GH is diabetogenic.</li> <li>• <b>Thyroid ++ but no hyper-function.</b></li> </ul>                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 5) <b>Neuro</b>                    | <ul style="list-style-type: none"> <li>• <b>Carpel Tunnel \$.</b></li> <li>• <b>Diabetic Neuropathy.</b></li> <li>• <b>Pit. Tumors</b> → pr. manifest.</li> <li>• <b>Emotional instability.</b> – hyper-somnolence.</li> </ul>                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 6) <b>Other</b>                    | <ul style="list-style-type: none"> <li>• <b>Tiredness</b> – ms. weakness.</li> <li>• <b>Lx hypertrophy</b> → hollow sounding voice.</li> <li>• <b>↑ Vit. D</b> → hypercalcuria → <b>Renal Stones.</b></li> <li>• <b>DM</b> → hyper-insulinemia → <b>HTN due to:</b> <ol style="list-style-type: none"> <li>a) <b>Na + H<sub>2</sub>O retention.</b></li> <li>b) <b>⊕ Sympathetic.</b></li> <li>c) <b>Atherogenic.</b></li> </ol> </li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p><b>Complications &amp; COD</b></p> <ol style="list-style-type: none"> <li>1) <b>Colonic polyps</b> → <b>Cancer colon.</b></li> <li>2) <b>DM</b> → <b>HTN.</b> <ol style="list-style-type: none"> <li>a) <b>CVS.</b></li> </ol> </li> </ol> <p><b>Activity of the Disease:</b></p> <ol style="list-style-type: none"> <li>1) <b>↑GH &gt; 10 ng</b> after glucose infusion.</li> <li>2) <b>↑ P</b> → dt <b>↑ Re-absorption</b> by GH.             <ol style="list-style-type: none"> <li>a) <b>↑ Sweating</b> → <b>DD.</b></li> </ol> </li> </ol> <div> <p><b>↑P:</b></p> <ol style="list-style-type: none"> <li>1) <b>RF.</b></li> <li>2) <b>Hypo-PTH.</b></li> <li>3) <b>Acromegaly</b> dt <b>↑GH.</b></li> </ol> </div> |



# DIABETES INSIPIDUS



## CL./P OF DI





# HYPO-PITUITARISM IN ADULTS

## (SIMMOND'S DISEASE)

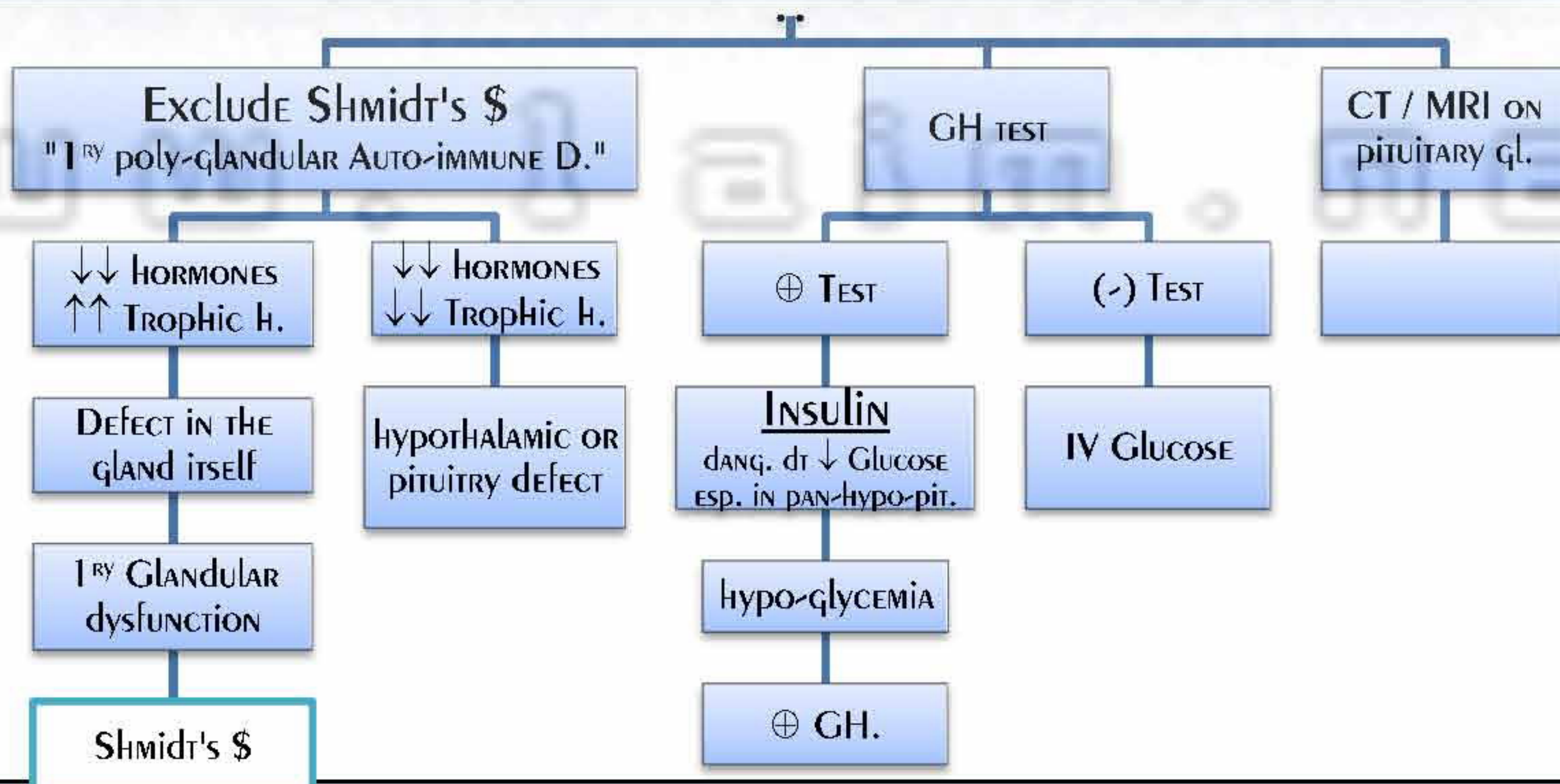
### ETIOLOGY = DVT CIN:

- 1) **VASCULAR** → **INFARCTION IN ANT. PITUITARY = SHEEHAN'S \$**  
(due to post-partum hge → marked ↓↓ bl. supply to pituitary gl. W has been doubled in size during pregnancy → ischemic injury)
- 2) **TUMOR** in pituitary.
- 3) **SURGERY**. (hypo-physectomy)
- 4) **INFLAM.** → TB – SARCIDOSIS.

### CL./P ⇒ MULTIPLE ↓ HORMONES:

- 1) ↓ **GH** in adult → WRINKLING AROUND EYES & MOUTH + EASY FATIGUE → "PRE-MATURE SENILITY"
  - 2) ↓ **GONADO TROPIN** → ↓ **GONADAL H.** → loss of libido – IMPOTENCE – AMENORRHEA.
  - 3) ↓ **TSH** → ↓ **Thyroid H.** → SEE LATER. (apathy – bradycardia....)
  - 4) ↓ **ACTH** → ↓ **Adrenal H.** → hypo-glycemia – hypotension – tiredness.
- *Long-Standing* → Alabaster Skin = pallor + hairless ... dt ↓ ACTH.
- **Acute hgc infarction in pit. Adenoma** → Auto hypophysectomy → Pituitary Apoplexy → sever headache + Acute hypo-pituitarism + pr. on Optic Chiasma ... Ophthalmo-plegia.

### INVESTIGATIONS for hypo-pituitarism



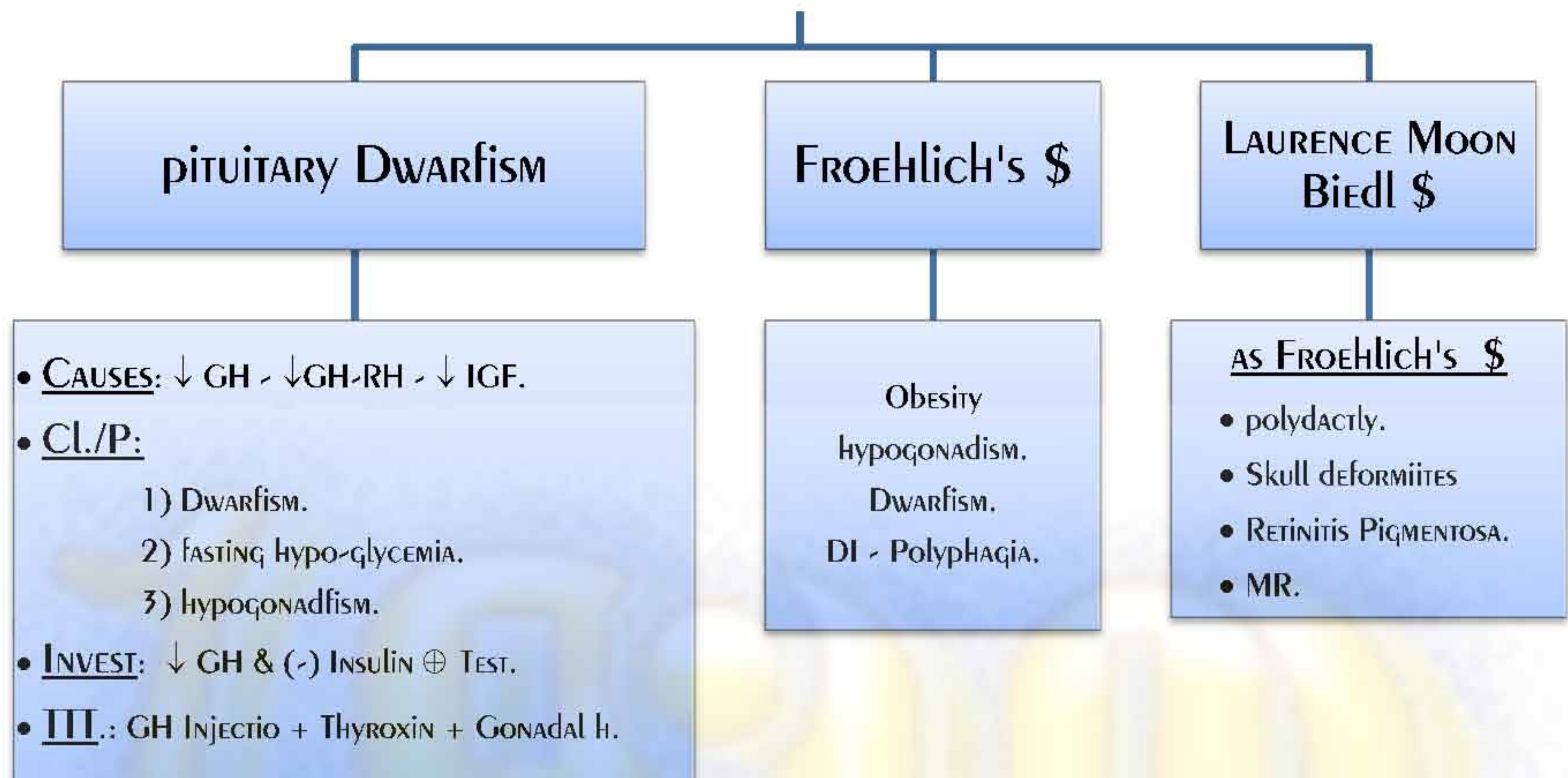
### TREATMENT = REPLACEMENT Th.

- 1) **Thyroxine**. (100-150 μ gm) *"Given e Steroids as Thyroxin → ↑ Cortisol Turnover → Adrenal Crisis"*
- 2) **STERoid** → **(INITIATION of TTT. MAY UNMASK DI)**
  - **Prednislone** → 7.5 mg (5 + 2.5)
  - **Hydro-CORTISONE** → 30 mg (20 + 10)
- 3) **GONADAL**

- ↓ Cortisol → ↓ GFR → No poly-uria → mask DI.
- Start of TTT. → ↑ GFR → poly-uria → unmask DI.

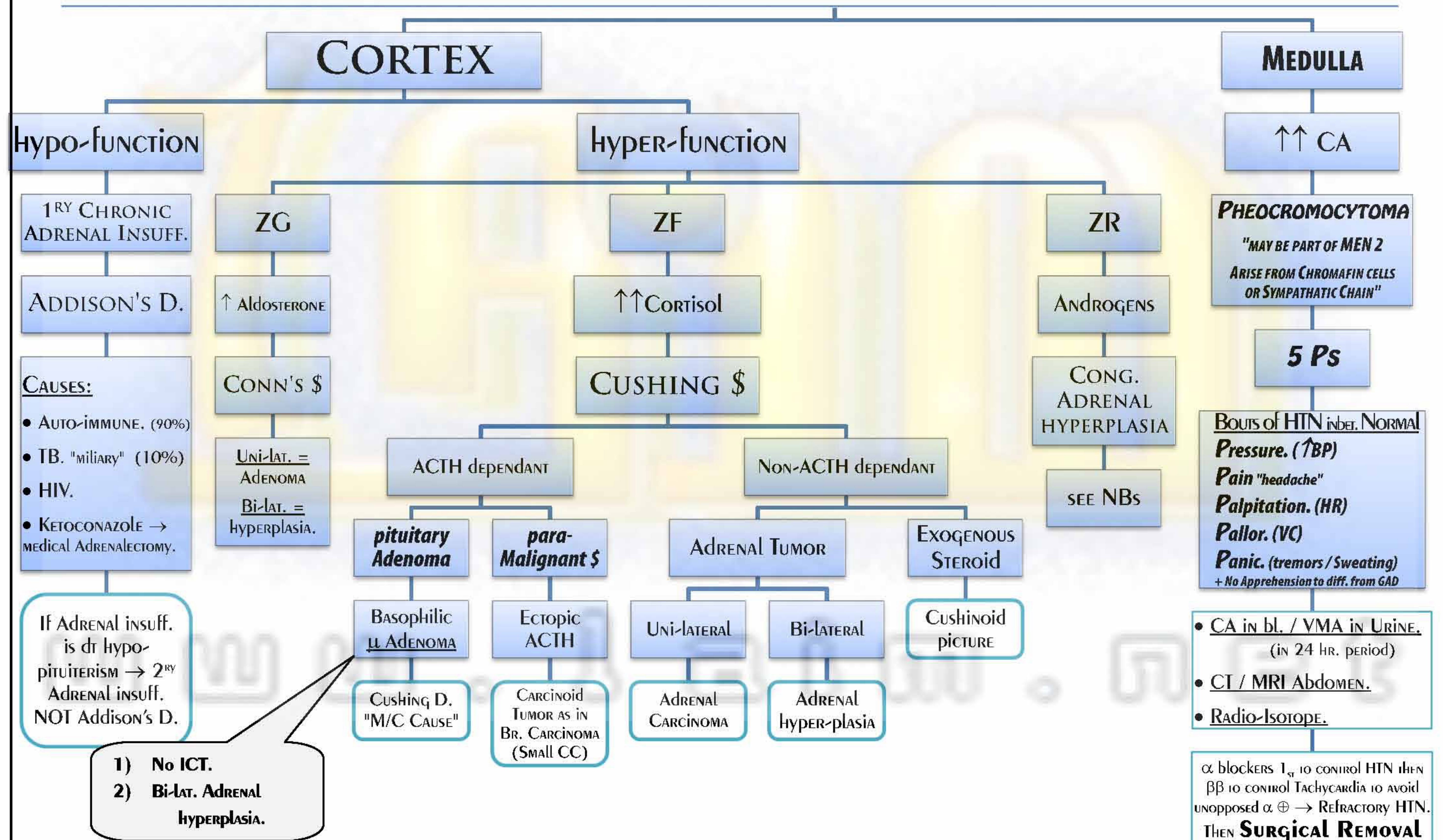


# HYPO-PITUITARISM IN CHILDHOOD





# Adrenal Gland



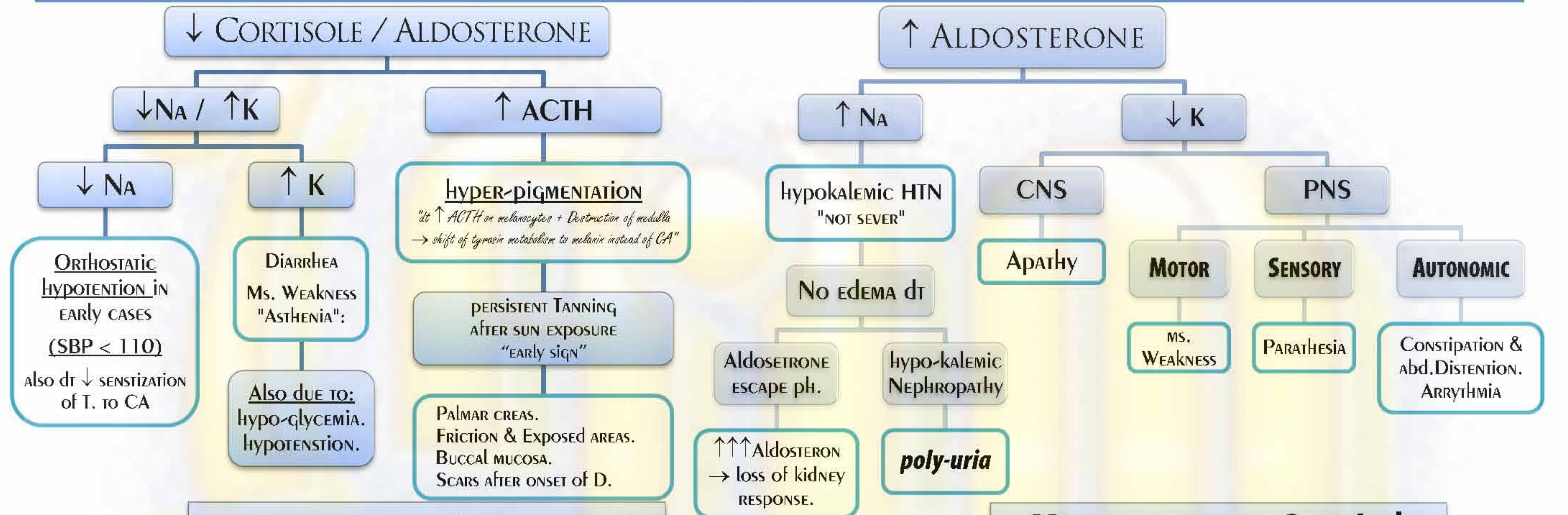


# ADDISON'S DISEASE

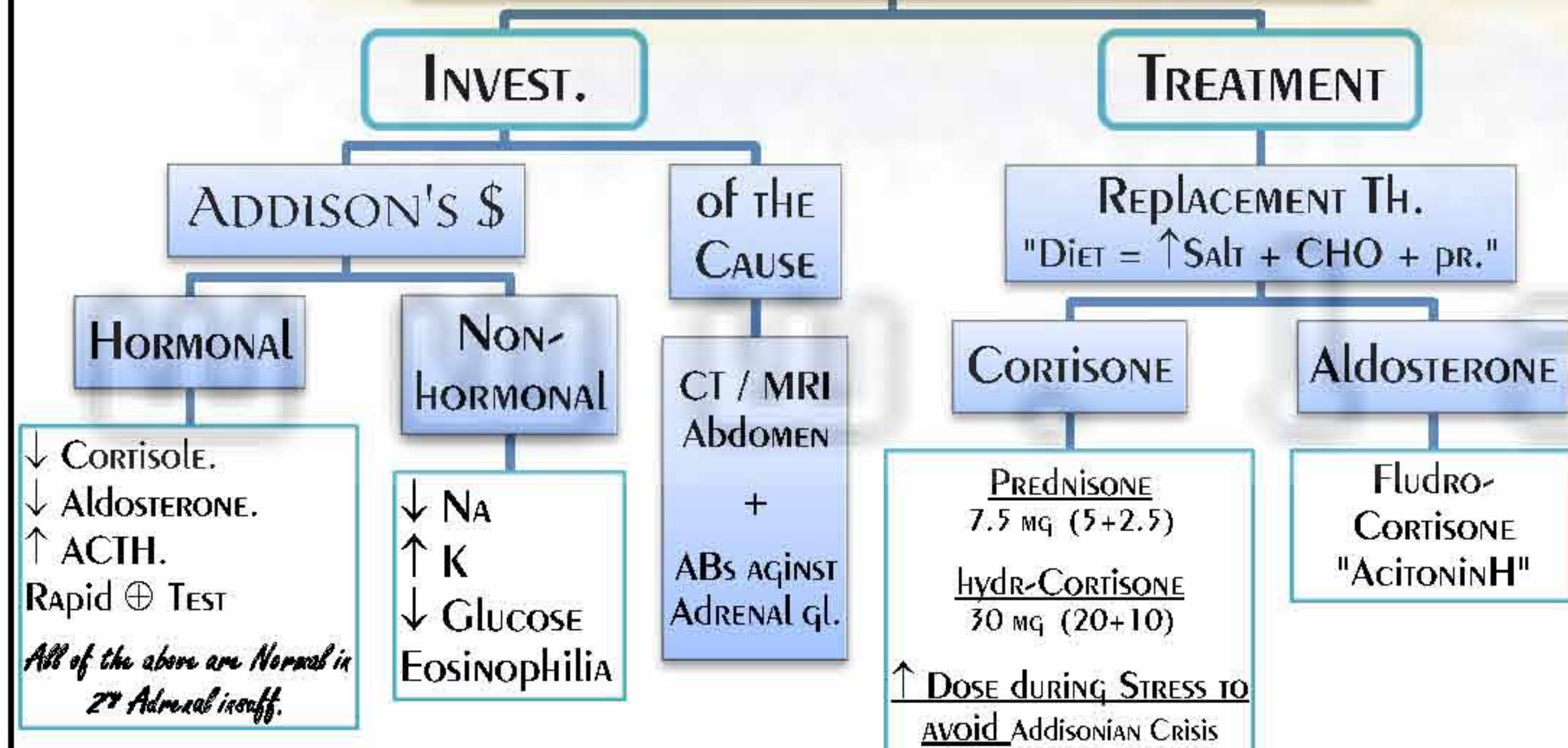
"1<sup>RY</sup> CHRONIC ADRENAL INSUFFICIENCY"

# CONN'S \$

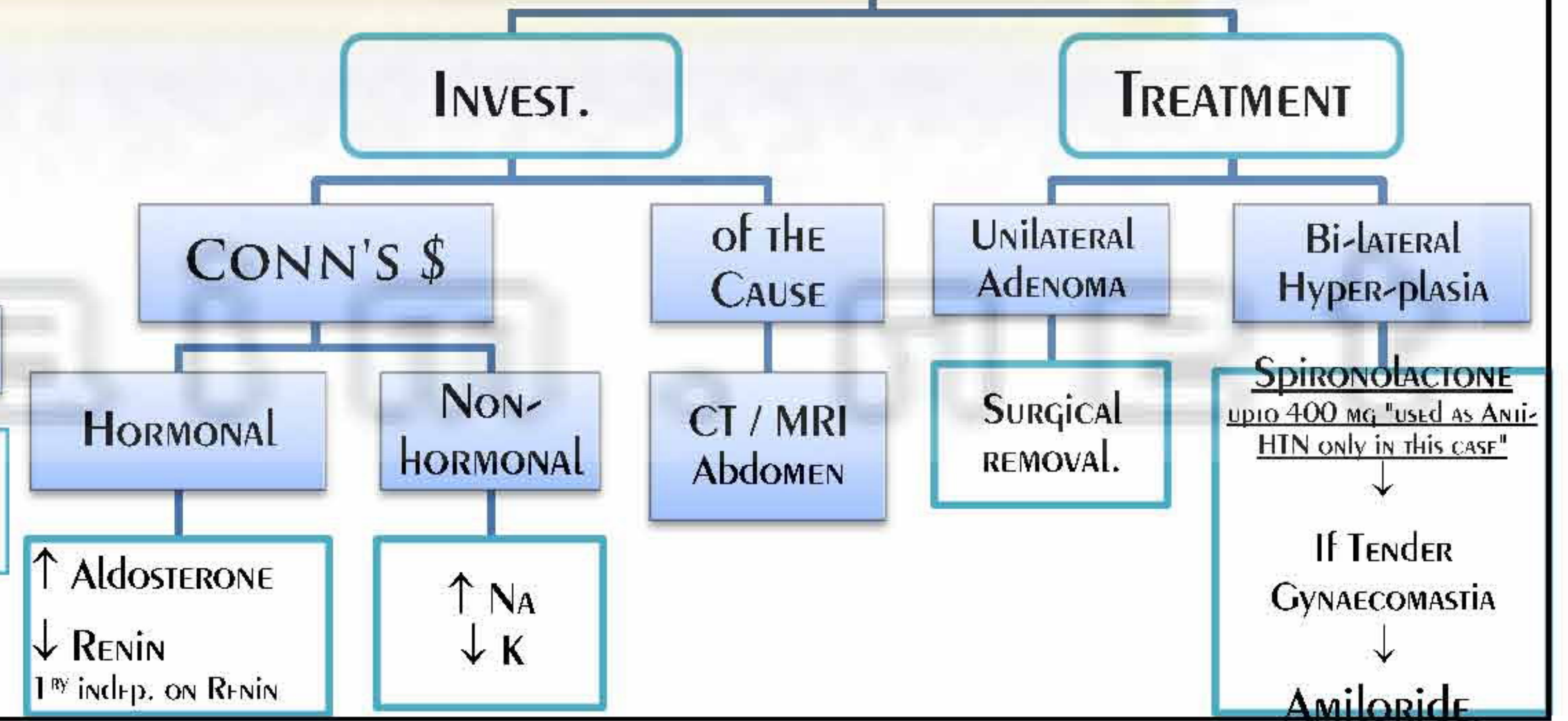
"1<sup>RY</sup> HYPER-ALDOSTERONISM"



## MANAGEMENT OF ADDISON'S D.



## MANAGEMENT OF CONN'S \$





# CUSHING'S \$ = ↑ CORTISOL

|                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                               |                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1) <b><u>METABOLIC</u></b>                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• <b>CHO</b> → Diabetogenic. → poly-depsia / poly-urea</li> <li>• <b>FAT</b> → lipolysis → ↑FFA → Dyslipidemia / Re-distrib.</li> <li>• <b>PROTEIN</b> → catabolism.</li> </ul> |                                                                                                                                                                                                                                                               |                                                                                |
| 2) <b>Ms.</b>                                                                                                                                                                                                                                                | → px. myopathy (sign not a symptom)                                                                                                                                                                                    | 3) <b>GIT</b>                                                                                                                                                                                                                                                 | → PU – Pancreatitis.                                                           |
| 4) <b>BONE / Ca</b>                                                                                                                                                                                                                                          | <b>Osteoporosis</b> → rib fracture.<br>↓ <b>LINEAR GROWTH</b> → short stature.                                                                                                                                         | 5) <b>RENAL</b>                                                                                                                                                                                                                                               | → Na-retention - ↓ K polyurea (K diuresis) – polydepsia.                       |
| 6) <b>CNS</b>                                                                                                                                                                                                                                                | → depression.                                                                                                                                                                                                          | 7) <b>ENDOCRINAL</b>                                                                                                                                                                                                                                          | → hypo-gonadism.                                                               |
| 8) <b>EYE</b>                                                                                                                                                                                                                                                | → Cataract / 2 <sup>ry</sup> Glaucoma.                                                                                                                                                                                 | 9) <b>IMMUNE SUPP.</b>                                                                                                                                                                                                                                        | → recurrent infections.                                                        |
| 10) <b><u>Skin:</u></b>                                                                                                                                                                                                                                      |                                                                                                                                                                                                                        | 11) <b>CVS</b>                                                                                                                                                                                                                                                | → 2 <sup>ry</sup> HTN dt (↑CA permissive effect + Salt & H <sub>2</sub> O ret. |
| a) <b>Thin skin</b> → cig. Paper.<br>b) <b>Rupture</b> → stria rubra.<br>c) <b>Delayed healing</b> → scars a hyper-pig.<br>d) <b>Hyper-pig.</b> → <b>localizing.</b><br>e) <b>Plethora dt polycythemia.</b><br>f) <b>Hirsutism + Acne &amp; NO Comedons.</b> |                                                                                                                                                                                                                        | g) <b><u>Re-distribution of fat</u></b> <ul style="list-style-type: none"> <li>• <b>FACE</b> → moon face.</li> <li>• <b>TRUNK</b> → trunkal obesity.</li> <li>• <b>INTER-SCAPULAR</b> → buffalo hump.</li> </ul> <b>NB:</b> buttock → hollow<br>Limbs → thin. |                                                                                |

| ADDISONIAN CRISIS ON TOP OF                                                                                             | DIAGNOSTIC CRITERIA OF CONN'S \$.                                                                                                                | DIAGNOSTIC CRITERIA. OF CUSHING                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• <b>STRESS</b></li> <li>• <b>INFECTION</b></li> <li>• <b>TRAUMA.</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>Diastolic HTN + NO edema.</b></li> <li>• <b>↑ Aldosterone.</b></li> <li>• <b>↓ RENIN.</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>30-40 ys.</b></li> <li>• <b>FEMALE &gt; MALES</b></li> <li>• <b>SEE below.</b></li> </ul> |



# DIAGNOSTIC FLOW CHART FOR A PT. SUSPECTED TO BE CUSHING'S \$

## When to Suspect Cushing?!

- 1)  $\uparrow$  BS +  $\uparrow$  NA +  $\downarrow$  K.
- 2) **BLOOD**  $\rightarrow$   $\uparrow$  RBCs.  
 $\rightarrow$   $\uparrow$  Neutrophils.  
 $\downarrow$  Eosinophils.  
 $\downarrow$  Lymphocytes.

## DEXAMETHAZONE supp. TEST

small dose to (-) pituitary gl.  
(0.5 mg / 6hrs. for 48 hrs.)

supp.

pseudo-cushing  
for DD

Syndrom X  
(Obesity - HTN - DM -  
hyper-lipidemia)  
OCP

No supp.

CUSHING BUT  
WHERE?!

High dose Steroid  
(2 mg / 6hrs. for 48 hrs.)

supp.

pituitary Basophilic  
 $\mu$  Adenoma

MRI / selective venous  
sampling

Trans-sphenoidal  
hypophysectomy

No supp.

Undetectable  
ACTH dt  $\uparrow$  Cortisol

Adrenal  
Tumor

CT abdomen

Adrenal  
Adenoma

Surgical  
Removal

Adrenal  
Carcinoma

Inoperable dt  
metastases

## Nelson's \$

pituitary Tumor++ after  
adrenalectomy  $\rightarrow$   $\uparrow$  ACTH  
 $\rightarrow$   $\uparrow$  skin pigmentation

$\uparrow$  ACTH

para-malignant \$  
Ectopic ACTH

Search for tumor  
by CT / MRI

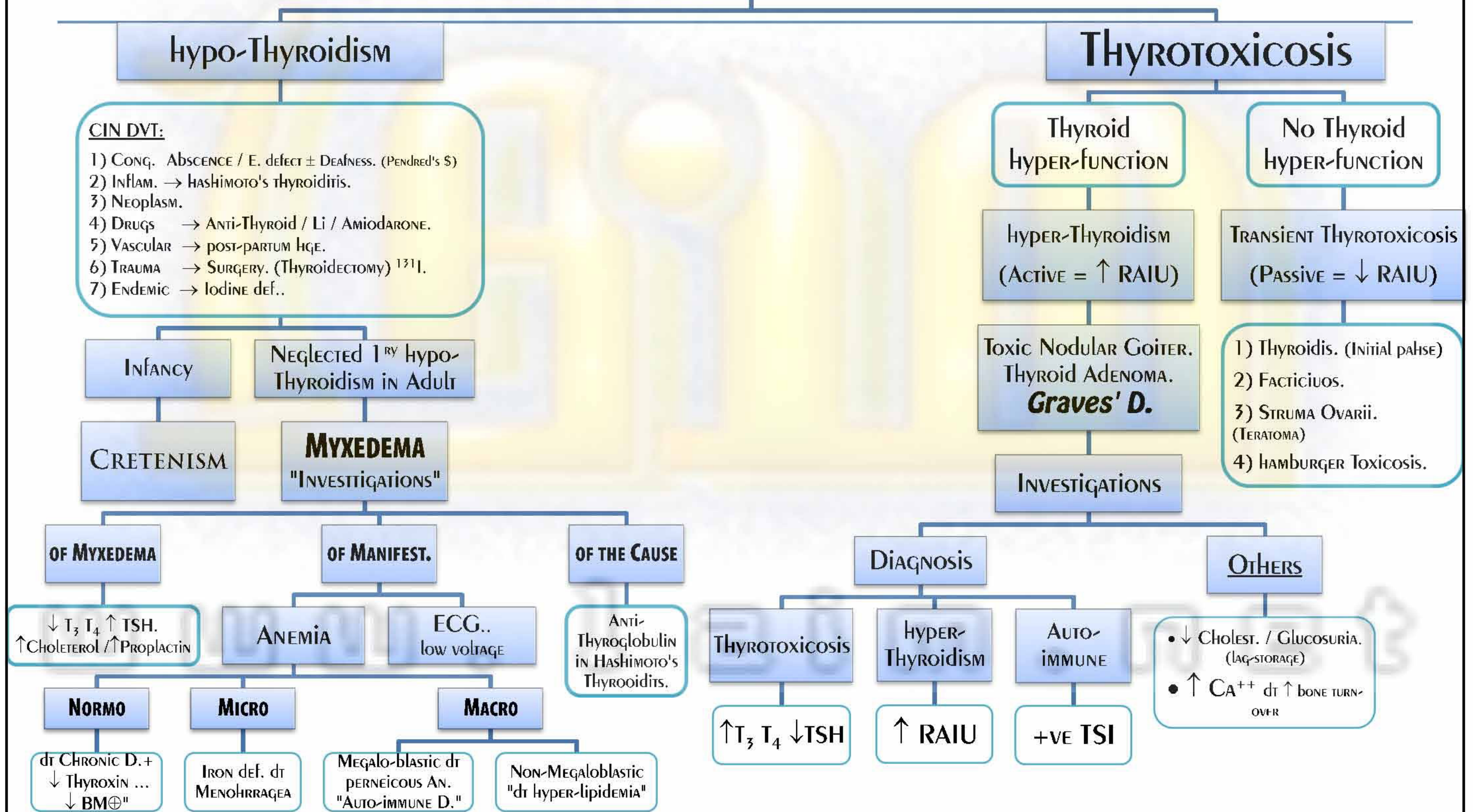
Surgical Removal

## MEDICAL TTT. OF CUSHING'S \$:

- 1) Diet =  $\uparrow$  protein + KCL Orally.
- 2) DM  $\rightarrow$  Insulin.
- 3) Medical Adrenalectomy  $\rightarrow$   
**KETOCONAZOLE / METYAPRONE.**



# THYROID GLAND





# MYXEDEMA

*neglected 1<sup>st</sup> hypothyroidism in adult*

*→ accumulation of **MPS***

*→ binds to water → Thickened features.*

**Myxedema** → 2<sup>ry</sup> hypo-pituitarism  
(pituitary myxedema)

|                                           |                                                                                                                                                                                                                                                  |
|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) GENERAL                                | <ul style="list-style-type: none"> <li>INTOLERANCE TO <u>cold</u> weather.</li> <li>Tiredness – week – wt. gain.</li> </ul>                                                                                                                      |
| 2) FACE                                   | <ul style="list-style-type: none"> <li>BLOATED – <b>puffiness</b></li> <li>Loss of OUTER 1/3 of eye brow.</li> <li>CAROTENEMIA..... (Thyroxine is ess. for conversion of CAROTENES to Vit. A)</li> <li>Lips &amp; Tongue → Thickened.</li> </ul> |
| 3) Skin                                   | <ul style="list-style-type: none"> <li>Dry - Thickened dt MPS. (Non-pitting)</li> </ul>                                                                                                                                                          |
| 4) NEURO                                  | <ul style="list-style-type: none"> <li>Slow mov. + poor memory.</li> <li>Vocal cords → HOARSENESS.</li> <li>CARPAL TUNNEL S.</li> <li><b>Tendon jerks</b>    <b>hung up Reflex.</b></li> <li><b>Myxedemat Madness.</b></li> </ul>                |
| 5) Ms.                                    | Px. Myopathy.                                                                                                                                                                                                                                    |
| 6) CVS                                    | <ul style="list-style-type: none"> <li>↓ HR + pericardial eff. (dt MPS)</li> <li>ATHEROSCLEROSIS DUE TO (↑ TSH + hyperlipidemia) → HTN. (Diastolic)</li> <li>→ ISHD (start low dose then ↑ gradually)</li> <li>→ Claudication.</li> </ul>        |
| 7) GIT                                    | ↓ motility → Constipation.<br>→ bact. over-gr. in SI → Malabsorption S.                                                                                                                                                                          |
| 8) GENITAL                                | MENORRAGIA. (↑ TRH → ↑ prolactin → (-) FSH / LH → MENORRAGIA → IRON def. An.)                                                                                                                                                                    |
| 9) MYXEDEMA COMA                          | SEE NBs.                                                                                                                                                                                                                                         |
| p. 27 ..... Hypo-thyroidism in pregnancy. |                                                                                                                                                                                                                                                  |

## DD of puffiness:

- Nephrotic / Nephritic.
- Myxedema.
- Chronic Cough. "Lower lid"
- SVC CL—

## hypothyroidism problem

- FEMALE 30 -40 ys.
- Constipation.
- Skin changes. (Dry / Thick)
- . . . . .

## TREATMENT of MYXEDEMA = **L-THYROXINE**

- START low dose. (25 – 30 µgm)
- Gradually ↑ dose / 2wks upto 150 µgm to Avoid ISHD dt Atherosclerosis.
- MAX. DOSE = 300 µgm.



## GENERAL SYMPTOMS

-  → INTOL. TO HOT WEATHER + Wt. loss & Good Appetite.
-  → GYNAECOMASTIA.
- CHILDREN → TALL STATURE.

# GRAVE'S DISEASE

"AUTO-IMMUNE D. AGAINST Thyroid GL. → production of TSI (IgG)  
→ ACTS AS TSH → ⊕ TSH Rs → ↑ Thyroid Release"

## TRIAD

### hypothyroidism problem

-  30 -50 ys.
- ONSET: GRADUAL ONSET.
- COURSE: REMISSION / EXACERBATION.
- ppt. by: EMOTIONAL STRESS, INFECTION & (E. Coli / Yersinia)

| THYROID GL.                                                                                                                                                                                                                 | DERMOPATHY                                                                                                                                                                                                                                                    | OPHTHALMOPATHY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                                                 |                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                            |                  |          |                                                 |                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------|-------------------------------------------------|-----------------------------------------|
| <ul style="list-style-type: none"><li>• Diffuse ++.</li><li>• Non-tender.</li><li>• ↑ Vascularity<br/>(systolic <u>thrill</u> &amp; <u>bruit</u> over the thyroid GL.)</li></ul>                                            | <ol style="list-style-type: none"><li>1) Skin → SWEATY-WARM – flushed<br/>(palmar crease) dt VD.</li><li>2) Nails → onycholysis “PLUMMER’S NAILS”</li><li>3) PRE-tibial MYXEDEMA → itchy swellings.</li><li>4) GRAVE’S clubbing THYROID ACRO-PACHY.</li></ol> | <table><tr><th>Non-infiltrative</th><th>Infiltrative</th></tr><tr><td><ol style="list-style-type: none"><li>1) Staring look → Dalrymple’s.</li><li>2) Lid Lag → VON GRAEVE’S</li><li>3) Infrequent blinking → STELLWAG.</li><li>4) Fine tremors on gentle closure of UL → ROSSENBACK’S.</li></ol></td><td><p>secretion of exophthalmos subst... lymphocytic infiltr. Of</p><table><tr><th>RETRO-ORBITAL T.</th><th>EOM “MR”</th></tr><tr><td>↓<br/>proptosis<br/>Exophthalmus.<br/>(bi-lateral)</td><td>↓<br/>Weak convergence<br/>(Moebius Sign)</td></tr></table></td></tr></table> | Non-infiltrative | Infiltrative                                    | <ol style="list-style-type: none"><li>1) Staring look → Dalrymple’s.</li><li>2) Lid Lag → VON GRAEVE’S</li><li>3) Infrequent blinking → STELLWAG.</li><li>4) Fine tremors on gentle closure of UL → ROSSENBACK’S.</li></ol> | <p>secretion of exophthalmos subst... lymphocytic infiltr. Of</p> <table><tr><th>RETRO-ORBITAL T.</th><th>EOM “MR”</th></tr><tr><td>↓<br/>proptosis<br/>Exophthalmus.<br/>(bi-lateral)</td><td>↓<br/>Weak convergence<br/>(Moebius Sign)</td></tr></table> | RETRO-ORBITAL T. | EOM “MR” | ↓<br>proptosis<br>Exophthalmus.<br>(bi-lateral) | ↓<br>Weak convergence<br>(Moebius Sign) |
| Non-infiltrative                                                                                                                                                                                                            | Infiltrative                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                                                 |                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                            |                  |          |                                                 |                                         |
| <ol style="list-style-type: none"><li>1) Staring look → Dalrymple’s.</li><li>2) Lid Lag → VON GRAEVE’S</li><li>3) Infrequent blinking → STELLWAG.</li><li>4) Fine tremors on gentle closure of UL → ROSSENBACK’S.</li></ol> | <p>secretion of exophthalmos subst... lymphocytic infiltr. Of</p> <table><tr><th>RETRO-ORBITAL T.</th><th>EOM “MR”</th></tr><tr><td>↓<br/>proptosis<br/>Exophthalmus.<br/>(bi-lateral)</td><td>↓<br/>Weak convergence<br/>(Moebius Sign)</td></tr></table>    | RETRO-ORBITAL T.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | EOM “MR”         | ↓<br>proptosis<br>Exophthalmus.<br>(bi-lateral) | ↓<br>Weak convergence<br>(Moebius Sign)                                                                                                                                                                                     |                                                                                                                                                                                                                                                            |                  |          |                                                 |                                         |
| RETRO-ORBITAL T.                                                                                                                                                                                                            | EOM “MR”                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                                                 |                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                            |                  |          |                                                 |                                         |
| ↓<br>proptosis<br>Exophthalmus.<br>(bi-lateral)                                                                                                                                                                             | ↓<br>Weak convergence<br>(Moebius Sign)                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                                                 |                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                            |                  |          |                                                 |                                         |

## OTHERS

|          |                                                                                                                                                                                                                                                                                                                          |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) NEURO | • Nervousness, anxiety, insomnia + Fine tremors. (No Apprehension to diff. From GAD)                                                                                                                                                                                                                                     |
| 2) Ms.   | - Px. myopathy ± MG (Auto-immune)                                                                                                                                                                                                                                                                                        |
| 3) BONE  | - ↑ bone turnover → Osteoporosis                                                                                                                                                                                                                                                                                         |
| 4) CVS   | <ul style="list-style-type: none"> <li>- ↑ HR → palpitations ± AF</li> <li>- <b>hyper-dynamic circ. Dt</b> (↑ SBP dt ↑ COP + ↓ DBP dt VD) <ul style="list-style-type: none"> <li>○ water hammer pulse.</li> <li>○ ↑ HS over PA.</li> </ul> </li> <li>• Murmur → Hemic. Peri-cardial rub like "Lerman scratch"</li> </ul> |
| 5) GIT   | → ⊕ Gastro-colic R. → hyper-defecation → wt. loss / ↑ Appetite.                                                                                                                                                                                                                                                          |

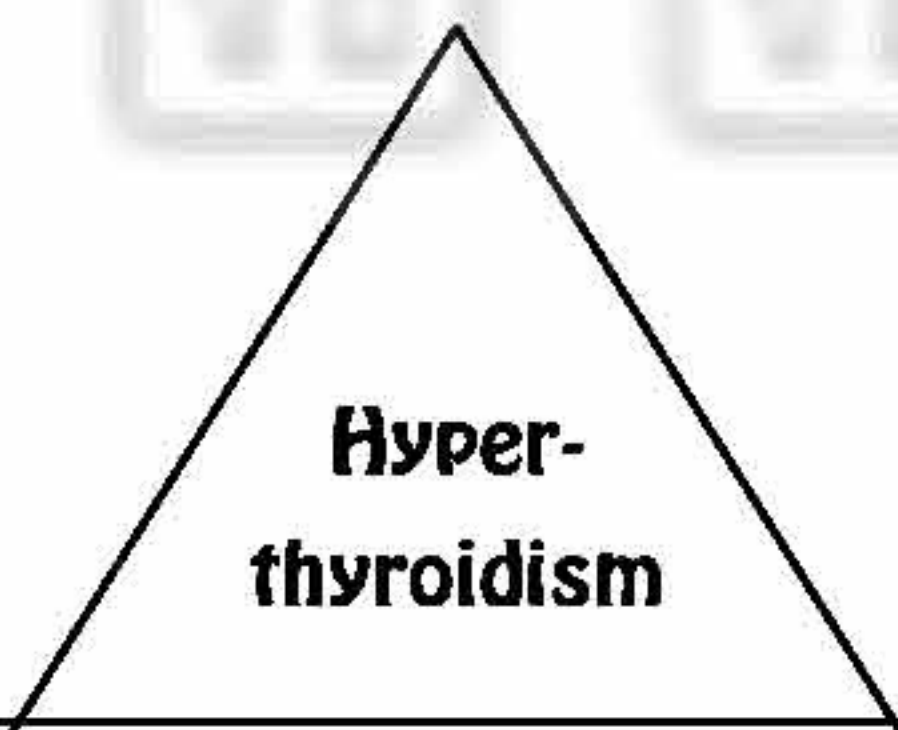
### MONO-SYMPTOMATIC

"one manifest. pre-dominates  
eg. AF "Thyro-cardia" in elderly"



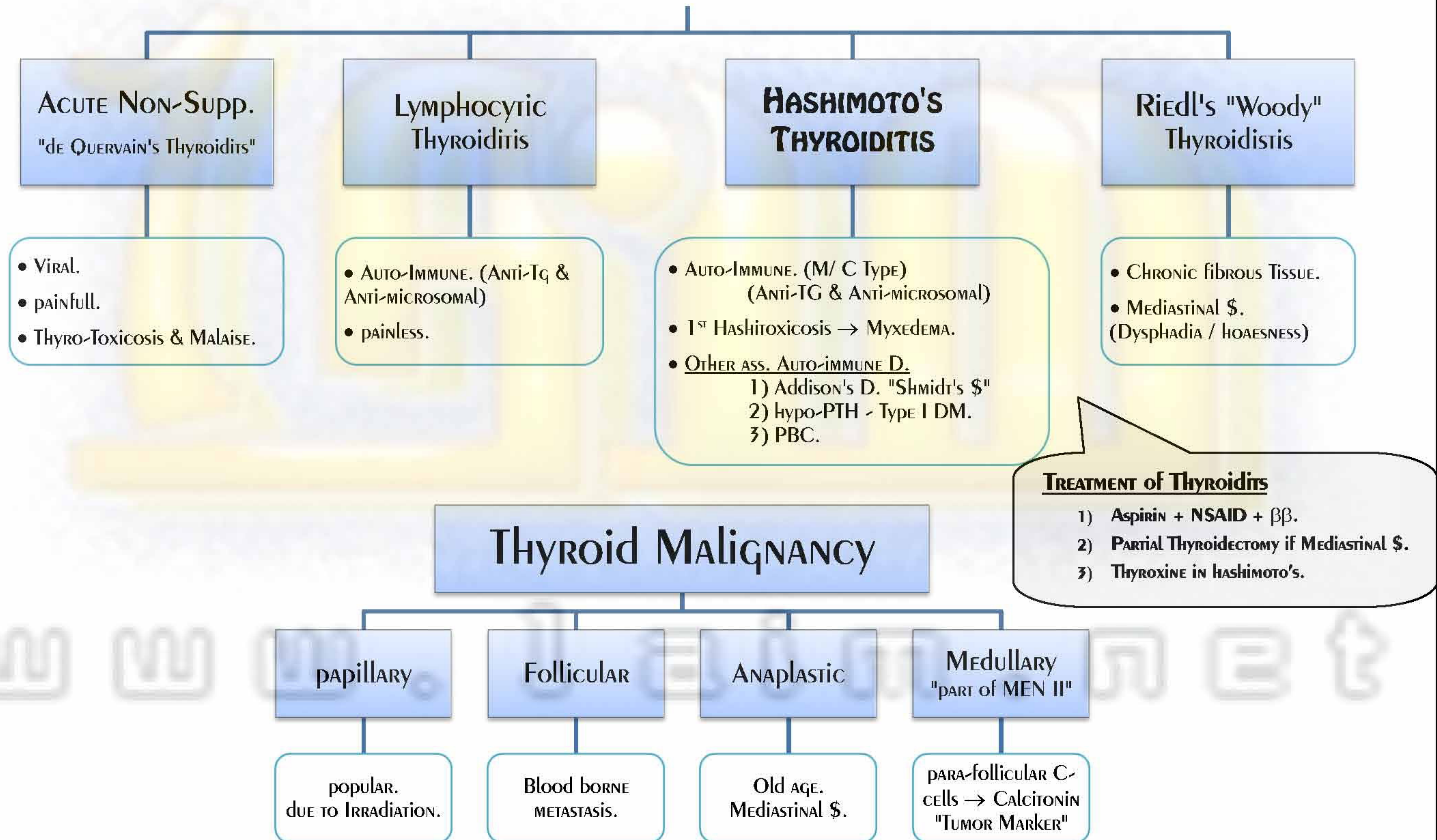
# ➤ Treatment of Grave's D.

|              | MEDICAL                                                                                                                                                                                                                                                             | SURGERY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <sup>131</sup> I                                                                                                                                                                   |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| INDICATIONS  | 1) 1 <sup>st</sup> ATTACK IN ADULTS > 40 ys.<br>2) BEFORE SURGERY → TO KEEP THE PT. EUTHYROID.<br>3) PT. REFUSING / UNFIT FOR SURGERY. (PREGNANCY)                                                                                                                  | 1) RECURRENT. (AFTER MEDICAL)<br>2) POOR DRUG COMPLIANCE.<br>3) HUGE GOITER / MALIGNANCY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1) RECURRENT AFTER MEDICAL & SURGICAL.<br>2) # OF SURGERY.                                                                                                                         |
| S/E          | 1) M-P RASH. (COMMON)<br>2) GIT UPSET.<br>• PROPHYLTHIO-URACIL → Agranulocytosis.<br>• CARBIMAZOLE → Fetal goiter if given during pregnancy.                                                                                                                        | 1) Lx. N. palsy.<br>2) TRANSIENT hypo-CALCEMIA.<br>3) Hypo-THYROIDISM.<br>4) POST. OP. THYROTOXICOSIS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1) ↑ DOSE → hypo-THYROIDISM. (Myxedema)<br>2) ↓ DOSE → recurrence.<br>3) # IN PREGNANCY / LACTATION / CHILDREN → RADIATION INDUCED GENETIC CANCER.                                 |
| PROCEDURE    | 1) DIAZEPAM → SEDATIVE.<br>2) ββ → ↓ Symp. OVER ACTIVITY. (↓ CONV. OF T <sub>4</sub> TO T <sub>3</sub> )<br>3) ANTI-THYROID → (-) NEW SYNTHESIS & NO EFFECT ON THE ALREADY FORMED → EFFECT APPEARS AFTER 6 WKS.                                                     | 1) SUB-TOTAL THYROIDECTOMY.<br>2) LUGOL'S IODINE b4 SURGERY <ul style="list-style-type: none"> <li>↓ Vascularity → ↓ size</li> <li>↓ Thyroxin → to be euthyroid.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b><sup>131</sup>I rapidly ACCUMULATES IN THYROID GL.</b><br>→ local β-radiation<br>→ poor penetration power<br>→ destroys the thyroid gl. only w out affecting the surrounding t. |
| ANTI-THYROID | <b>Prophyl Thio-URACIL:</b> of choice in PREGNANCY.<br><br><b>CARBIMAZOLE:</b> <ul style="list-style-type: none"> <li>START 40 – 60 mg/d.</li> <li>↓ 20 – 40 mg/d</li> <li>MD 5 – 20 mg/d.</li> <li>Stop AFTER 2 ys till pt. BECOMES EUTHYROID AT 5 mg/d</li> </ul> | <div style="text-align: center;"> <b>TREATMENT of Complications</b> </div> <div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>THYROTOXIC CRISIS</b> </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>DERMOPATHY</b><br/>"pretibial myxedema"         </div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>OPHTHALMOPATHY</b><br/>"Exophthalmus"         </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 60%;">           1) <b>Hyper-pyrexia</b> → cooling blankets.<br/>           2) <b>Disprop. Tachycardia upto AF</b> → Digitalis.<br/>           3) <b>Shock &amp; Coma</b> → Volume expansion.<br/>           4) <b>Hydro-CORTISONE</b> → to Avoid relative Adrenal insuff. dt<br/>               ↑ Cortisol turnover + ↓ Conv. Of T<sub>4</sub> to T<sub>3</sub><br/>           5) <b>Prophylthiouracil / Propranolol / K Iodide.</b> </div> <div style="display: flex; flex-direction: column; align-items: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">Topical STEROIDS</div> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">mild</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">SEVER</div> </div> <div style="display: flex; justify-content: space-around; width: 100%;"> <div style="border: 1px solid black; padding: 5px; text-align: center;">LUBRICATION by Artificial TEARS</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">CS + SUPRA-ORBITAL DEROOING</div> </div> </div> </div> |                                                                                                                                                                                    |



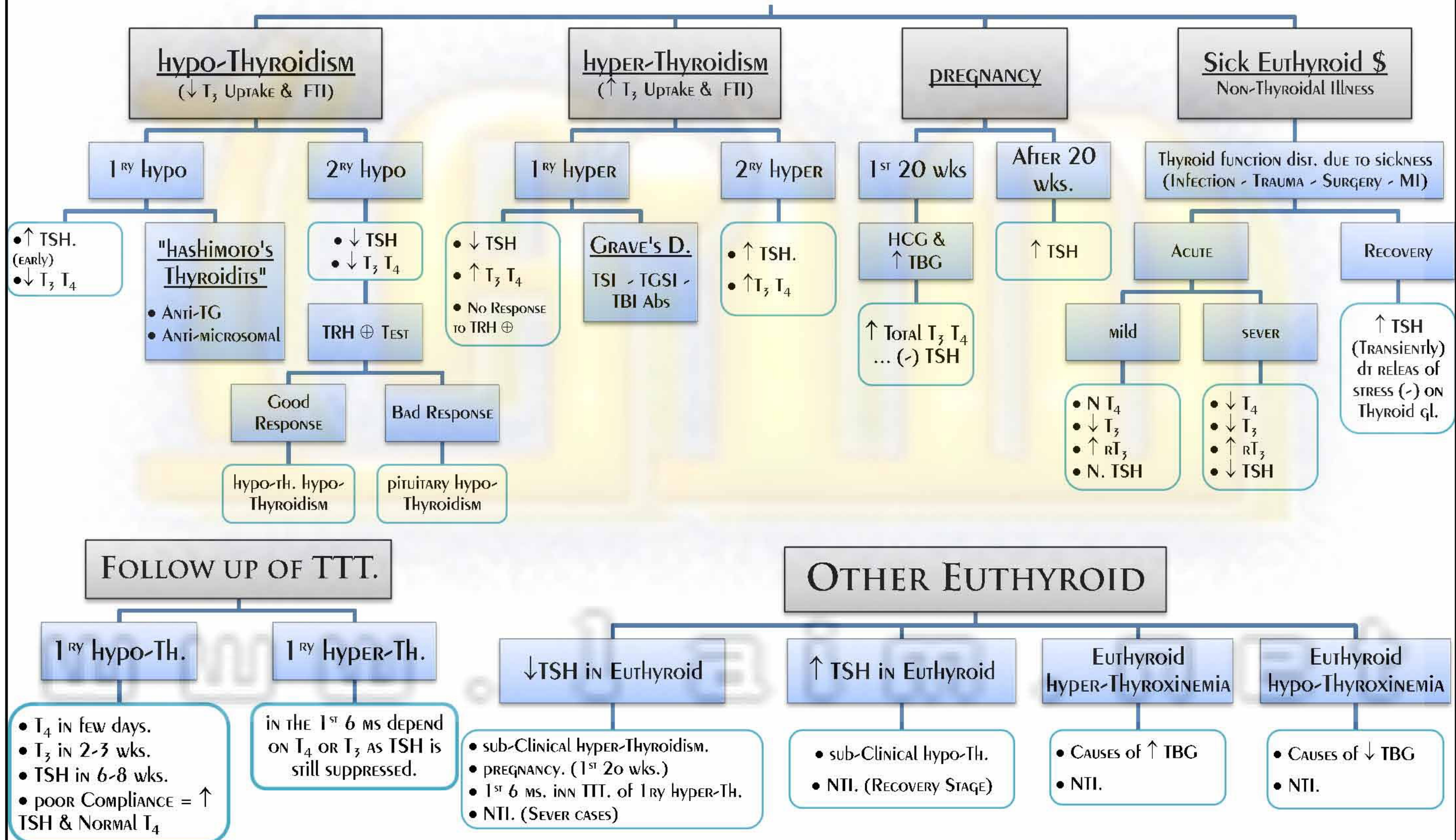


# THYROIDITIS





# CLINICAL PATHOLOGY





# HYPER-PARA-THYROID

|                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 <sup>RY</sup> HYPER-PTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2 <sup>RY</sup> HYPER-PTH                                                                                             | 3 <sup>RY</sup> HYPER-PTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------------|--------|----------------------------------|--------|--------------------------------------------|------------------------|--------------------------|-----|--------------------------------|---|---------|---------|--------|---|----|-----|-----|---|---|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| ETIOLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"><li>No hypo-calcemia. (No 2<sup>ry</sup> CAUSE)</li><li>hyper-active gL → AUTONOMOUS SEC. → No feedback (-)<br/>(Although Normal or high Ca)</li></ul>                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"><li>2<sup>ry</sup> to hypo-calcemia.</li><li>✓ feed back (-)</li></ul>              | <ol style="list-style-type: none"><li>long-standing 2<sup>ry</sup> hyper-PTH ..... يَقلِبُ ..... 3<sup>ry</sup></li><li>AUTONOMOUS SEC. (hyper-plasia) → No feedback (-)<br/>(Although Normal or high Ca)</li></ol>                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| CAUSES                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ol style="list-style-type: none"><li>Adenoma → single gL.</li><li>hyper-plasia → 4 glands.</li><li><b>MEN = MULTIPLE ENDOCRINE NEOPLASIA.</b><div><div><b>MEN - I</b><br/>"WERMER'S \$"<br/>3 Ps<br/><ul style="list-style-type: none"><li>Pituitary Tumor.</li><li>Pancreatic Tumor.</li><li>PTH. (hyper)</li></ul></div><div><b>MEN - II A</b><br/>"SIPPLE'S \$"<br/>OMA<br/><ul style="list-style-type: none"><li>pheochromocytoma.</li><li>medullary carcinoma.</li><li>PTH. (hyper)</li></ul></div><div><b>MEN - II B</b><br/>OMA + Marfanoid features.</div></div></li></ol> | <ol style="list-style-type: none"><li>CRF → ROD.</li><li>MAL-ABSORPTION \$.</li><li>Rickets – Osteomalacia.</li></ol> | <ol style="list-style-type: none"><li>CRF + ↑ Ca<sup>++</sup> (dt 3<sup>ry</sup> hyper-PTH + Ca Supplements)</li><li>MAL-ABSORPTION \$.</li></ol> <div>Cl./P of Hyper-Calcemia = 1<sup>ry</sup> &amp; 3<sup>ry</sup><table><tr><td>BONES</td><td>Back ache – pain – Arthralgia – pseudo-gout<br/>Weakness / hypotonia. (TETANY 3 also)</td></tr><tr><td>STONES</td><td>Renal Stones / Nephrocalcinosis.</td></tr><tr><td>GROANS</td><td>N V – Abd. Pain – PU – ACUTE PANCREATITIS.</td></tr><tr><td>PSYCHIATRIC OVER-TONES</td><td>Drowsiness – Depression.</td></tr><tr><td>CVS</td><td>HTN (VC) + ↓ HR. (so Give CCB)</td></tr></table></div> | BONES           | Back ache – pain – Arthralgia – pseudo-gout<br>Weakness / hypotonia. (TETANY 3 also) | STONES | Renal Stones / Nephrocalcinosis. | GROANS | N V – Abd. Pain – PU – ACUTE PANCREATITIS. | PSYCHIATRIC OVER-TONES | Drowsiness – Depression. | CVS | HTN (VC) + ↓ HR. (so Give CCB) |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| BONES                                                                                                                                                                                                                                                                                                                                                                                                                                       | Back ache – pain – Arthralgia – pseudo-gout<br>Weakness / hypotonia. (TETANY 3 also)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| STONES                                                                                                                                                                                                                                                                                                                                                                                                                                      | Renal Stones / Nephrocalcinosis.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| GROANS                                                                                                                                                                                                                                                                                                                                                                                                                                      | N V – Abd. Pain – PU – ACUTE PANCREATITIS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| PSYCHIATRIC OVER-TONES                                                                                                                                                                                                                                                                                                                                                                                                                      | Drowsiness – Depression.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| CVS                                                                                                                                                                                                                                                                                                                                                                                                                                         | HTN (VC) + ↓ HR. (so Give CCB)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| INVEST. for hyper-PTH                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                       | TREATMENT of hyper-PTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| LAB                                                                                                                                                                                                                                                                                                                                                                                                                                         | X-Ray                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                       | TUMOR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| <table><thead><tr><th></th><th>1<sup>ry</sup></th><th>2<sup>ry</sup></th><th>3<sup>ry</sup></th></tr></thead><tbody><tr><td>URINE Ca/P</td><td>↑</td><td>↑</td><td>↑</td></tr><tr><td>S. Ca</td><td>↑ OR N.</td><td>↓ OR N.</td><td>↑</td></tr><tr><td>S. P</td><td>↓</td><td>↑ E CRF</td><td>↑ E CRF</td></tr><tr><td>S. ALP</td><td>↑</td><td>↑↑</td><td>↑↑↑</td></tr><tr><td>PTH</td><td>↑</td><td>↑</td><td>↑</td></tr></tbody></table> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1 <sup>ry</sup>                                                                                                       | 2 <sup>ry</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 3 <sup>ry</sup> | URINE Ca/P                                                                           | ↑      | ↑                                | ↑      | S. Ca                                      | ↑ OR N.                | ↓ OR N.                  | ↑   | S. P                           | ↓ | ↑ E CRF | ↑ E CRF | S. ALP | ↑ | ↑↑ | ↑↑↑ | PTH | ↑ | ↑ | ↑ | <div>BONE<div>1) Skull → MOTTling. (salt/pepper)</div><div>2) long BONES → Ground glass.</div><div>3) VERTEBRAE → Cod-fish app.</div><div>4) TEETH → loss of lamina dura to diff. from MM.</div></div> <div>Kidney<div>STONES / Nephro-calcinosis</div></div> |  | Exclude OTHER CAUSES <div>1) MM → electroph.</div> <div>2) Thyro → T3 T4 TSH.</div> <div>3) Vit. D TOX. → Cortisone (-) if st.</div> <div>4) Sarcoidosis → Conv. E.</div> <div>5) TuOMR → CT / MRI / Radio-isotope Scan.</div> | <div>Adenoma<div>Surgical Removal</div></div> <div>hyper-plasia<div>REOMVE 4 gl. &amp; implant A PART IN THE FOR-ARM</div></div> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1 <sup>ry</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2 <sup>ry</sup>                                                                                                       | 3 <sup>ry</sup>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| URINE Ca/P                                                                                                                                                                                                                                                                                                                                                                                                                                  | ↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ↑                                                                                                                     | ↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| S. Ca                                                                                                                                                                                                                                                                                                                                                                                                                                       | ↑ OR N.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ↓ OR N.                                                                                                               | ↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| S. P                                                                                                                                                                                                                                                                                                                                                                                                                                        | ↓                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ↑ E CRF                                                                                                               | ↑ E CRF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| S. ALP                                                                                                                                                                                                                                                                                                                                                                                                                                      | ↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ↑↑                                                                                                                    | ↑↑↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
| PTH                                                                                                                                                                                                                                                                                                                                                                                                                                         | ↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ↑                                                                                                                     | ↑                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                       | Hyper-calcemia <div>1<sup>st</sup> Aid<div>• Saline.</div><div>• Lasix.</div></div> <div>↓ Ca<div>• ↑ P Orally.</div><div>• Malignancy Calcitonin / Bisphosph.</div><div>• Sarcoidosis Steroid</div></div> <div>HD<div>لو غلبت</div></div>                                                                                                                                                                                                                                                                                                                                                                                                      |                 |                                                                                      |        |                                  |        |                                            |                        |                          |     |                                |   |         |         |        |   |    |     |     |   |   |   |                                                                                                                                                                                                                                                               |  |                                                                                                                                                                                                                                |                                                                                                                                  |



# CALCIUM

## hypo-CALCEMIA

- 1) hypo-Albumin. (m/c CAUSE)
- 2) CRF.
- 3) hypo & pseudo hypo-PTH.
- 4) ACUTE PANCREATITIS.

"dr Ca deposition in PANCREATIC NECROTIC T. ALTHOUGH PANCREATITIS is CAUSED by hyper-CALCEMIA"

## hyper-CALCEMIA

↑↑ PTH

- 1) 1<sup>RY</sup> & 3<sup>RY</sup> NOT 2<sup>RY</sup> hyper-PTH
- 2) PARA MALIGNANT \$.

↑↑ Vit. D

- 1) Vit. D Toxicity.
- 2) SARCOIDOSIS.

**MALIGNANCY**  
(due to IL-1)

- 1) OSTEOLYTIC METASTASIS
- 2) Multiple Myeloma.
- 3) Lymphoma. (dr Vit. D3 + IL-1)

**MISCELLANEOUS**

- 1) Milk - Alkali \$.
- 2) IMMOBILIZATION → ⊕ BR.
- 3) Thiazides → ↓ CA EXCRETION.
- 4) hyper-Thyroid → ↑ BONE TURNOVER.

H - K - P all ↑  
or all ↓

## PHOSPHORUS

### hypo-phosphatemia

- 1) ↑ loss → RENAL loss → hyper-PTH - FANCONI \$.  
→ GIT loss → VOMITING DIARRHEA
- 2) ↓ Absorption → ↓ Vit. D & MALABSORPTION \$.
- 3) IC shift INSULIN th. in TTT. of DKA & Alkalosis.

### hyper-phosphatemia

- 1) hypo & pseudo hypo-PTH.
- 2) CRF. (↓ EXCRETION)
- 3) ACROMEGALY (↑ GH)
- 4) EC shift (Acidosis)

## OTHER METABOLIC BONE DISEASES

### OSTEOPOROSIS

Slow PROCESS  
IN SENILE

All Lab ARE  
NORMAL

ACUTE  
IMMOBILIZATION

⊕ OSTEOCLAST  
↑ CA/P  
↓ PTH

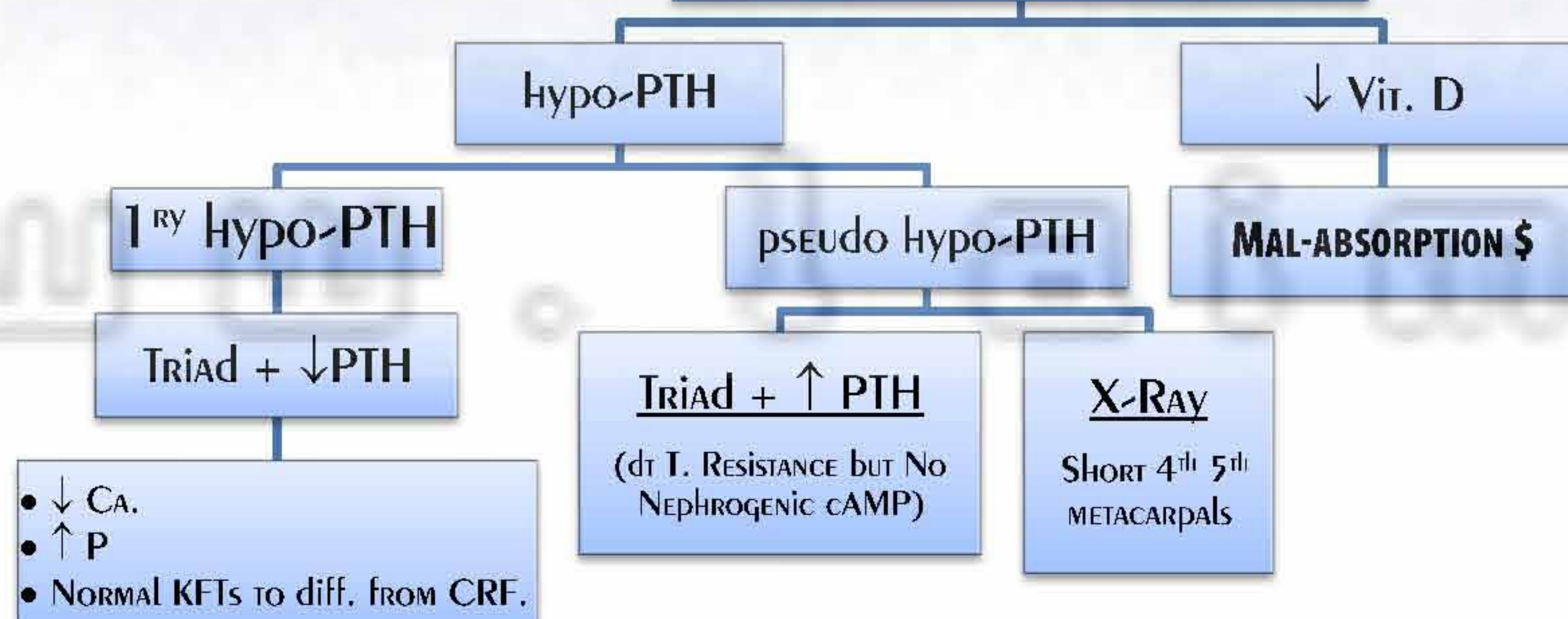
### PAGE'T'S DISEASES

- 1) ↑ ALP. (10 X)
- 2) CA/P .. NORMAL
- 3) ↑ BONE TURNOVER → ...  
... ↑ Hydroxy-proline.



# HYPO-PARA-THYROID

|                        | <b><i>HYPO-PTH</i></b>                                                                                                          | <b><i>PSEUDO - HYPO-PTH</i></b>                                                                                                                                                                                                                                                                                                     | <b><i>PSEUDO – PSEUDO HYPO-PTH</i></b>                       |                |               |            |        |        |        |     |       |                                                       |                                  |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------|---------------|------------|--------|--------|--------|-----|-------|-------------------------------------------------------|----------------------------------|
| <b><u>ETIOLOGY</u></b> | 1) Idiopathic.<br>2) SURGICAL REMOVAL -IRRADIATION<br>3) CONGENITAL hypoplasia “Di-GEORGE \$”<br>(Absence of Thymus & PT gland) | 1) TISSUE RESISTANCE TO PTH.<br>2) No ↓ PTH.                                                                                                                                                                                                                                                                                        | As pseudo in CL./P<br>→ BUT (NORMAL) Ca/P<br>→ So NO Tetany. |                |               |            |        |        |        |     |       |                                                       |                                  |
| <b><u>CL./P</u></b>    | <b>TETANY.</b>                                                                                                                  | <b><u>TETANY + Albright’s OSTEO-dystrophy:</u></b> <table><tr><td>أنت قصير</td><td>SHORT STATURE.</td></tr><tr><td>و دماغك كبيرة</td><td>Big Skull.</td></tr><tr><td>و طخين</td><td>Obese.</td></tr><tr><td>و أهبل</td><td>MR.</td></tr><tr><td>X-Ray</td><td>SHORT 4<sup>th</sup> / 5<sup>th</sup> META-CARPALS.</td></tr></table> | أنت قصير                                                     | SHORT STATURE. | و دماغك كبيرة | Big Skull. | و طخين | Obese. | و أهبل | MR. | X-Ray | SHORT 4 <sup>th</sup> / 5 <sup>th</sup> META-CARPALS. | <b>SKELETAL AbNORMALity Only</b> |
| أنت قصير               | SHORT STATURE.                                                                                                                  |                                                                                                                                                                                                                                                                                                                                     |                                                              |                |               |            |        |        |        |     |       |                                                       |                                  |
| و دماغك كبيرة          | Big Skull.                                                                                                                      |                                                                                                                                                                                                                                                                                                                                     |                                                              |                |               |            |        |        |        |     |       |                                                       |                                  |
| و طخين                 | Obese.                                                                                                                          |                                                                                                                                                                                                                                                                                                                                     |                                                              |                |               |            |        |        |        |     |       |                                                       |                                  |
| و أهبل                 | MR.                                                                                                                             |                                                                                                                                                                                                                                                                                                                                     |                                                              |                |               |            |        |        |        |     |       |                                                       |                                  |
| X-Ray                  | SHORT 4 <sup>th</sup> / 5 <sup>th</sup> META-CARPALS.                                                                           |                                                                                                                                                                                                                                                                                                                                     |                                                              |                |               |            |        |        |        |     |       |                                                       |                                  |
| <b><u>INVEST.</u></b>  | ○ Triad + ↓PTH                                                                                                                  | ○ Triad + ↑PTH. + X-Ray hands + No Neph. cAMP<br><div>INVEST. for HYPO-CALCEMIA</div>                                                                                                                                                                                                                                               | 1) NORMAL (Ca/P)<br>2) No Nephrogenic cAMP.                  |                |               |            |        |        |        |     |       |                                                       |                                  |



## LONG-TERM ECTODERMAL CHANGES DUE TO HYPOCALCEMIA:

- 1) شعر → Alopecia.
- 2) جلد → Rough.
- 3) أظافر → BRITTLE.
- 4) أسنان → punctuate holes.



# TETANY

➤ DEF.: ↑↑ EXCITABILITY OF THE CNS & PNS DT ↓↓ IONIZED CA, MG, OR H. (ALKALOSIS).

Exchange Transfusion with Citrated  
Hl. → ↓CA & Mg

TETANY + Normal s. CA → Alkalosis as it ↓ Ionized form.  
HypoCALCEMIA + No TETANY → CRF. ... Acidosis ↑ Ionized form.

## ETIOLOGY

↓ CA "IONIZED"

hypo-PTH or  
pseudo hypo-PTH

hypo-CALCEMIA

EARLY

INFANT OF DIABETIC MOTHER  
PT / IUGR  
PER-NATAL ASPHYXIA

LATE  
(5-10 days)

↑P Diet,  
EQ. Cow milk &  
IMMATURE PTH.

↓VIT. D

↓INTAKE  
MAL-Absorption \$.

↓ Mg

↓ INTAKE

NUTRITION Insuff.  
TPN Insuff.

↑ loss

- CH. DIARRHEA.
- NEPHROTOXIC drugs.
- DIURETICS.

ALKALOSIS

"NORMAL TOTAL CA<sup>++</sup>  
BUT ↓IONIZED CA<sup>++</sup>"

HYPER-VENTILATION

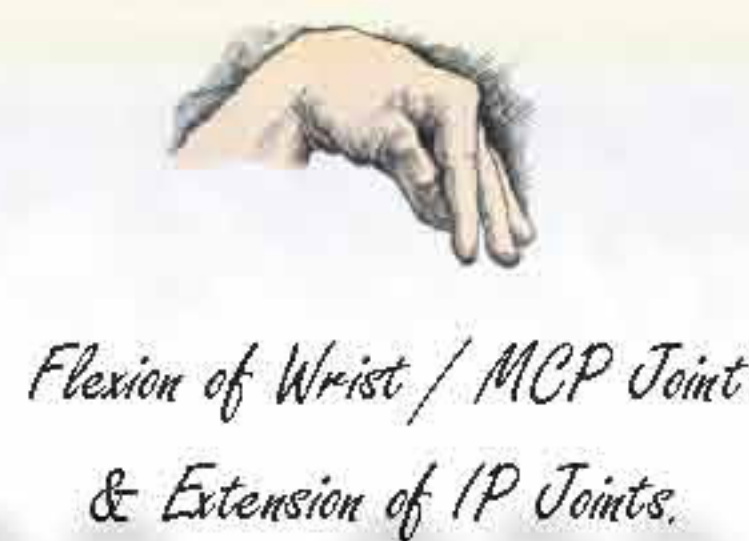
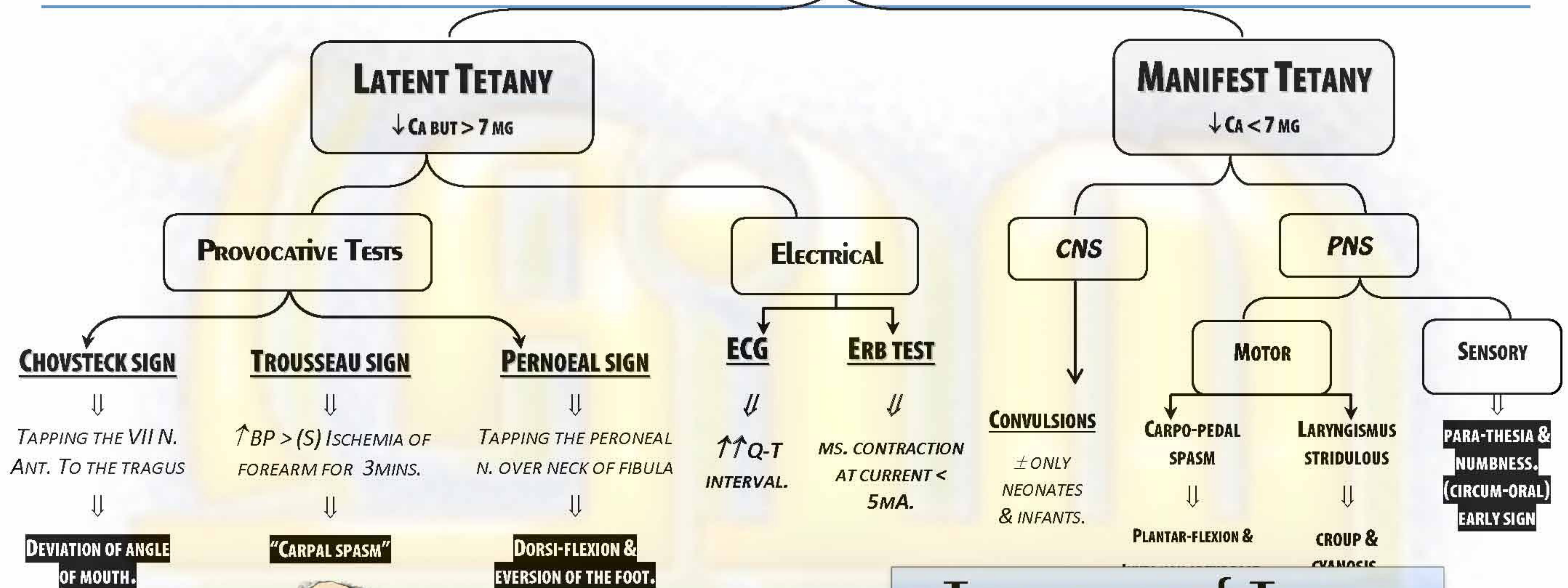
RESPIRATORY  
ALKALOSIS

EXCESS VOMITING /  
ALKALINE TH.

METABOLIC  
ALKALOSIS



# CL./P of TETANY



## TREATMENT of TETANY

### EMERGENCY

ABC + ...

ANTI-CONVULSANTS + O<sub>2</sub>  
in LARYNGISMUS STRIDULOUS

- 1) Ca GLUCANATE: 10% 10 ml V. slowly + MONITOR ↓HR
- 2) Mg GLUCANATE.
- 3) PSYCHOGENIC HYPER-VENTILATION ⇒  
RE-BREATHING in BAG.

### MAINTENANCE TH.

- Ca INTAKE. (DIET)
- CaCO<sub>3</sub>. (OS-CAL)
- Vit. D<sub>3</sub> (1 α hydroxylase)

### INVEST. FOR TETANY:

- 1) ↓Ca Mg pH. (↓Vit. D)
- 2) ↓PTH + ↓Nephrogenic cAMP.



# DIABETES MELLITUS

DM is th M/C CAUSE of:

- CRF. (ESRD)
- Amputation.
- Blindness.

|                  | TYPE I                                                                                                                                                                                              | TYPE II                                                                                                   |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| CAUSE            | $\beta$ -cell destruction<br>"Absolute Insulin def."                                                                                                                                                | INSULIN RESISTANCE<br>"Relative Insulin def."                                                             |
| Etiology         | <u>AUTO-IMMUNE Abs AGAINST (ICA)</u><br>$\beta$ -cell dt Viral infection / A. Feeding<br>DM occurs after destruction of > 80% of B cells                                                            | <u>Obesity (VISCERAL / CENTRAL)</u><br>→ Adipocyte secret (leptin / TNF / resistin)<br>→ ↑ Insulin level. |
| C-peptide        | x                                                                                                                                                                                                   | ✓                                                                                                         |
| • AGE            | < 30 ys – Thin                                                                                                                                                                                      | > 40 ys. – OBESE                                                                                          |
| • FH             | Uncommon (5 %)                                                                                                                                                                                      | Common (25 %)                                                                                             |
| • HLA ASS.       | HLA DR <sub>3,4</sub>                                                                                                                                                                               | x                                                                                                         |
| • ASS. IMMUNE D. | Thyroiditis / lupoid hepatitis / pernicious AN.                                                                                                                                                     | x                                                                                                         |
| PATHOLOGY        | <u>Insulinitis</u><br>"Islets infiltrated e lymphocytes"                                                                                                                                            | <u>Islet Amyloid deposition</u><br>"dt Amylin co-secreted e insulin"                                      |
| KETO-ACIDOSIS    | <u>Prone</u><br>(Occurs without ppt. factors)                                                                                                                                                       | <u>Un-common</u> ...except in Stress conditions<br>(infections – MI – surgery – pregnancy)                |
| TREATMENT        | Insulin ± Immunosuppressives.                                                                                                                                                                       | Oral hypo-glycemics → if failed → Insulin.                                                                |
|                  | <u>HONEY-MOON phase</u><br>"In early glycaemic control (insulin doses are ↓)<br>dt endog. Insulin release from the residual $\beta$ -cells.<br>→ Then complete destruction → Absolute Insulin def." |                                                                                                           |

**MODY: TTT. by**

- 1) Diet.
- 2) Oral hypo-glycemics.
- 3) Insulin..

**2<sup>RY</sup> CAUSES of DM:**

1) PANCREATIC:

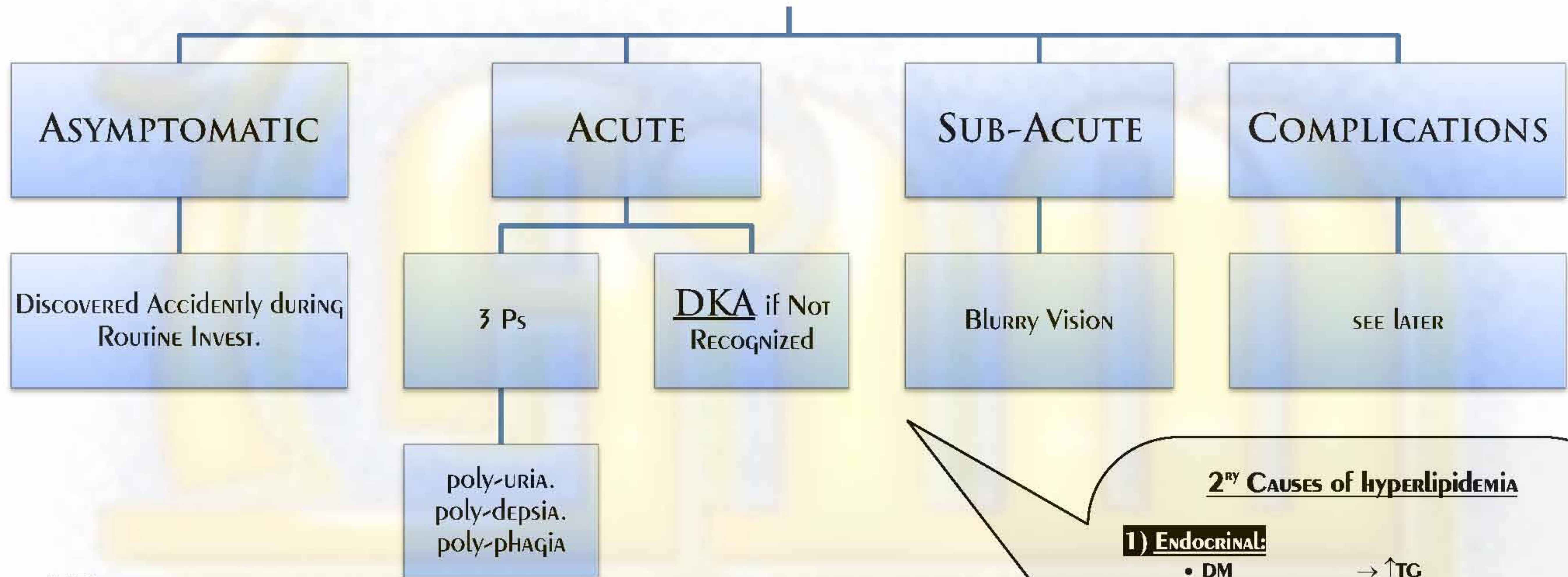
- Ch. PANCREATITIS.
- Cystic fibrosis.
- HEMOCHROMATOSIS.

2) ENDOCRINAL:

- Cushing S.
- HYPER-THYROIDISM.



# CLINICAL PICTURE OF DM



## NBs:

- 1) ONSET of DM in CHILDREN → NOCTURNAL ENURESIS.
- 2) ONSET of DM in FEMALES → PRURITIS VULVAE & VAGINITIS.
- 3) DM should be suspected in:
  - OBESE PT. → +VE FH of DM.
  - P. NEUROPATHY → Tingling & Numbness.
  - FEMALE PT. → LARGE babies – polyhydramnios – UN explained fetal death.

## 2<sup>RY</sup> CAUSES of hyperlipidemia

### 1) ENDOCRINAL:

- DM → ↑TG
- Hypo-Thyroidism → ↑CHOLESTEROL.

### 2) RENAL:

- Nephrotic S → ↑LDL & CHOLESTEROL.
- CRF → ↑TG.

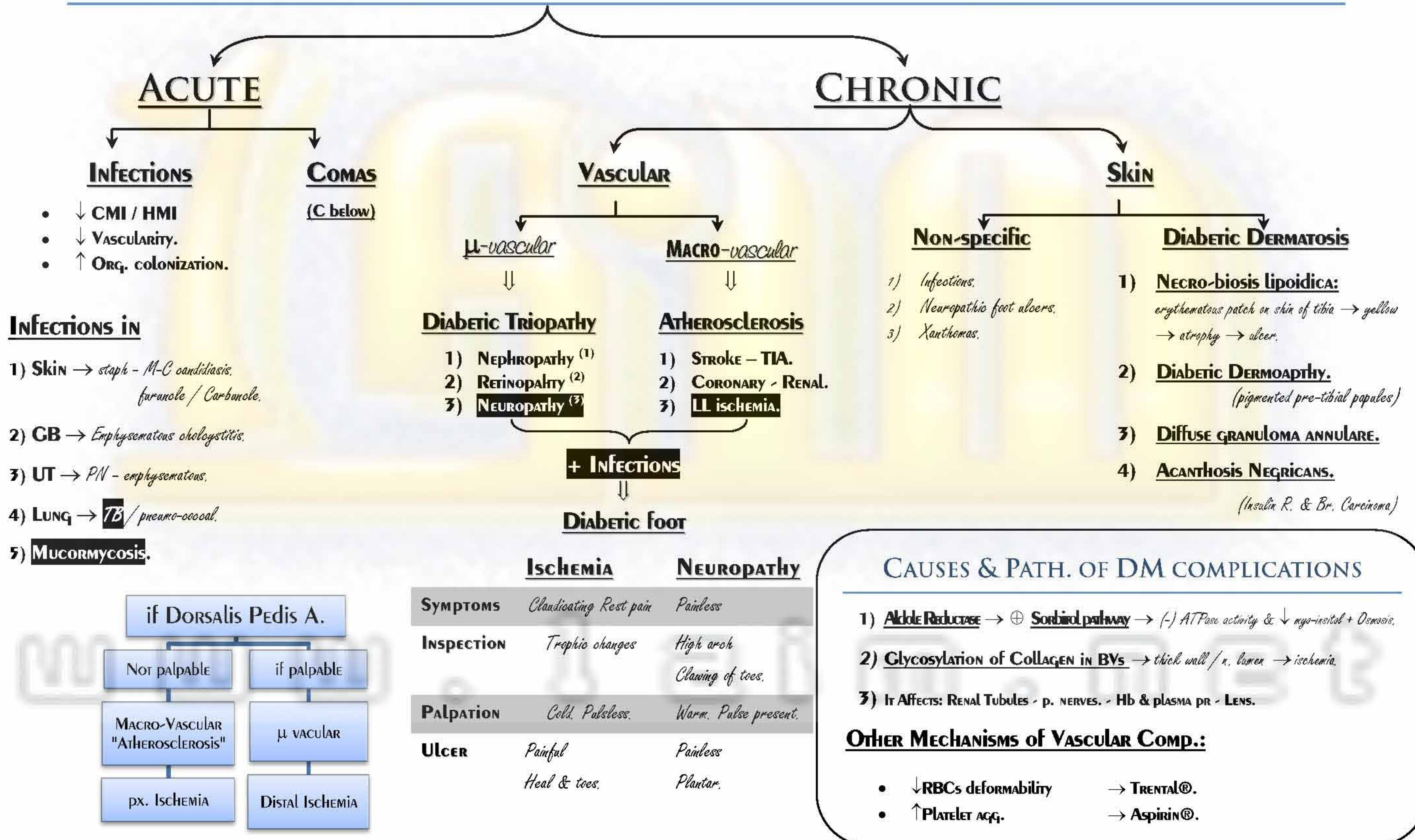
### 3) STORAGE D → GLYCOGEN SD. – GAUCHER'S D.

### 4) DRUGS.

- ββ (NS) → ↑TG
- Thiazides → ↑TG.
- Alcohol → ↑TG
- Steroids – OCP – Obesity.

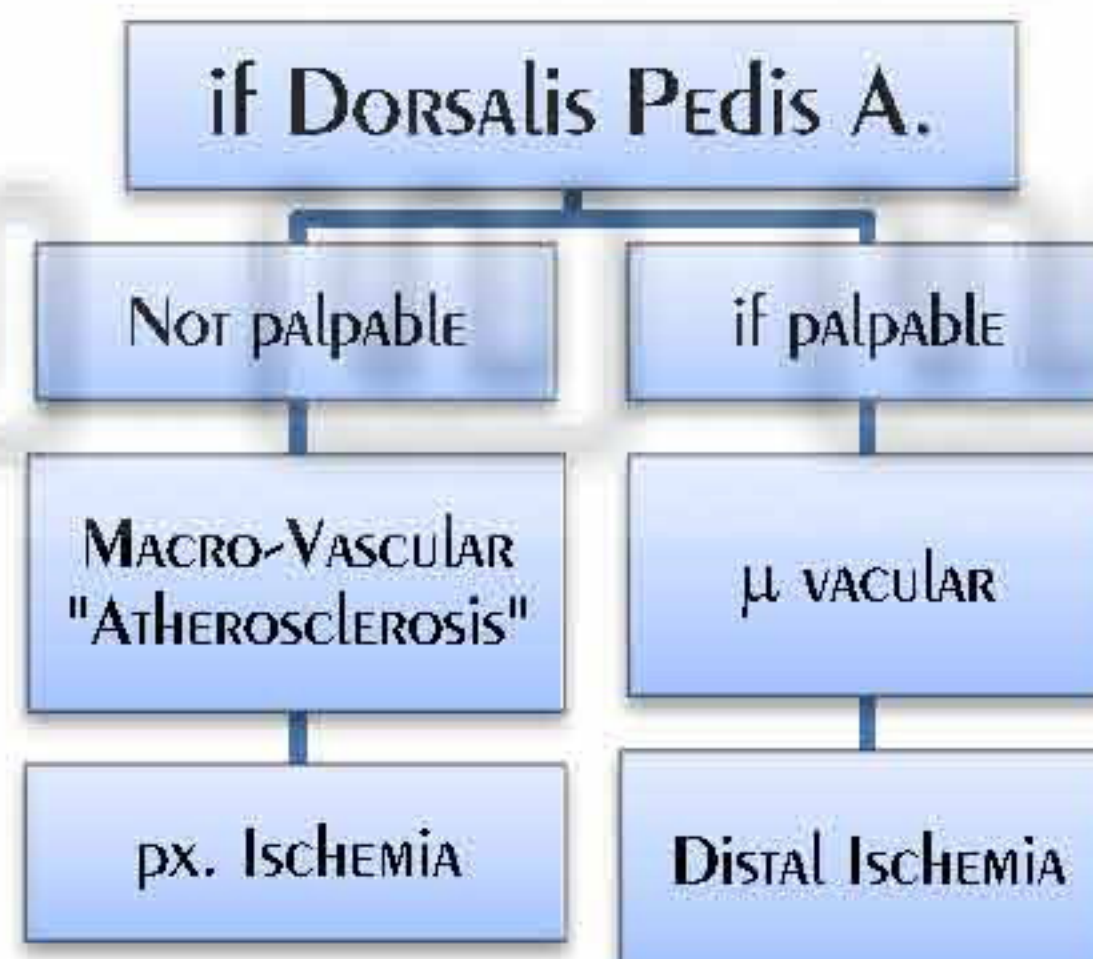


# DIABETIC COMPLICATIONS



## Infections in

- 1) Skin → staph - M-C candidiasis.  
furuncle / Carbuncle.
- 2) GB → Emphysematous cholecystitis.
- 3) UT → PN - emphysematous.
- 4) Lung → TB / pneumo-coccal.
- 5) **Mucormycosis.**



## CAUSES & PATH. OF DM COMPLICATIONS

- 1) **Aldehyde Reductase** → ⊕ Sorbitol pathway → (-) ATPase activity & ↓ myo-inositol + Osmosis.
- 2) **Glycosylation of COLLAGEN in BVs** → thick wall / n. lumen → ischemia.
- 3) It AFFECTS: RENAL TUBULES - p. NERVES - Hb & plasma pr - LENS.

## Other Mechanisms of Vascular Comp.:

- ↓ RBCs deformability → TRENTAL®.
- ↑ PLATELET acq. → Aspirin®.



# DIABETIC RETINOPATHY

" $\mu$  ANGIOPATHY of the RETINAL BVs."

## LEAKAGE

"loss of T. junction & pericyte"

- 1) ANEURYSM.
- 3) EDEMA.
- 2) HARD EXUDATES.  
"Lipid laden MO"
- 3) HGE

## Occlusion

- 1) BM  $\rightarrow$  THICKENING.
- 2) ENDOTH  $\rightarrow$  proliferation.
- 3) RBCs  $\rightarrow$  sticking.
- 4) platelets  $\rightarrow$  sticking.

**Ischemia & Hypoxia  
of the Retina**

**DURATION & CONTROL  
dependant**

## Other Ocular Complications

- **Lids**  $\rightarrow$  Styes - Xanthelasmas.
- **LENS**  $\rightarrow$  Cataract.
- **6<sup>th</sup> CN Palsy.**
- **RETINA**  $\rightarrow$  D. retinopathy.

**Cl./P = fundus**

## Non - PDR

As LEAKAGE path.

## Pre-PDR

- 1) ARTERIES  $\Rightarrow$  ATTENUATED.
- 2) VEINS  $\Rightarrow$  beading & looping.
- 3) COTTON-WOOL SPOTS.
- 4) Blot HGE.

## PDR

VE-GF SECRETION dt  
SEVERE ISCHEMIA

NV D & NV E

Rupture  
VITREOUS HGE

Fibrosis  
T RD

NV I = Rubiosis  
Iridis

Rupture  
Hyphema

Fibrosis  
NV GLAUCOMA



# DIABETIC KETO-ACIDOSIS

prophylacti  
c ABS

no Insulin ..... ppt by (infections "mucormycosis" / trauma / MI / surgery)

## METABOLISM

### KETO-ACIDOSIS

mild  
spont. corrected by Insulin

SEVER < 7  
NAHCO<sub>3</sub>

⊕ lipolysis

↑ FFA

↑ KB

### KETO-ACIDOSIS

### ACUTE ABDOMEN

HYPER-VENTILATION

"KUSSMAUL br"

IV Fluids = 6L

saline 1st

3L TO REPLACE ECF

Isotonic 1st

1/2 Tonic if..  
s. Na > 155

not give 1st t to avoid  
osmotic hemolysis of  
RBCs.

GLUCOSE 5%

"when BS ↓ to > 250 mg/dL"

3L TO REPLACE ICF

to Avoid  
hypoglycemia

to support Osmolarity  
to avoid sudden ↓ BS

CEREBRAL EDEMA.  
"Dysequilibrium \$"

↑ G Output

↓ G Uptake

Hyper-glycemia

↑ Osmolarity

OSMOTIC DIURESIS

"poly-uria"

## Dehydration

COMA  
also dt  
CNS (-) by KB

↓ RBF

↓ excretion of  
K<sup>+</sup>/H<sup>+</sup>

Hyper-kalemia  
/ Acidosis.

HEMOCONC.

DVT

Thrombo-  
embolism

Dry  
Skin

LMWH  
"Clexan SC"

## Hyper-kalemia

Initially dt  
Acidosis

↑ K Outflux

Hyperkalemia  
at the beginning.

THEN  
hypokalemia  
due to Insulin  
th. + polyuria.

Insulin  
REGULAR low dose 5U/HR.

to Avoid hypokalemia bec.

low dose  
Insulin

↓ Glucose output  
e minimal K uptake

No hypokalemia

high dose  
Insulin

↑ Glucose uptake  
mainly e ↑ K uptake

hypokalemia

When BS  
↓ to 250  
mg/dL

shift to  
Glucose 5%  
(see IV fluids)

## K THERAPY

↑ K  
> 5.5

DON'T GIVE  
K

NORMAL K  
3.5 - 5.5

20 mEq/L  
proph.

↓ K  
< 3.5

40 mEq/L

20 TO  
CORRECT THE  
ERROR

20  
proph.



# COMAS IN DM

|               | HYPO-GLYCEMIC COMA                                                                                            | DKA COMA                                                                                                                                                                                          | HYPER-OSMOLAR COMA                                                                                                                                                                                      | LACTIC ACIDOSIS                                                                                                                                                                                                                                                                                                                                        |
|---------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Insulin level | <b>Insulin Shock</b><br><b>OVER TTT. &amp; UN-CORRESPONDING DIET.</b><br>(Insulin Shock / Oral-hypoglycemics) | <b>Absolute Insulin deficiency</b> <ul style="list-style-type: none"> <li>Newly presenting DM.</li> <li>Neglect the ttt.</li> </ul> <b>Relative Insulin def.</b><br><i>dt Stress – Infection.</i> | <b>MINIMAL Insulin def.</b> <ul style="list-style-type: none"> <li>CAN'T UTILIZE GLUCOSE</li> <li>hyperglycemia &gt;1000</li> <li>hyper-Osmolarity of bl.</li> <li>Dehydration (Stroke - MI)</li> </ul> | <b>BIGUANIDES</b> in "high dose" in Advanced LIVER or Kidney or COPD <ul style="list-style-type: none"> <li>↑↑↑ LACTIC A.</li> <li>SEVER METABOLIC Acidosis</li> <li>↑↑↑ TTT.:               <ol style="list-style-type: none"> <li>1) Stop the offending drug.</li> <li>2) Rehydration</li> <li>3) Isotonic NaHCO<sub>3</sub>.</li> </ol> </li> </ul> |
| ONSET         | ACUTE.                                                                                                        | GRADUAL.                                                                                                                                                                                          |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| Pulse         | TACHYCARDIA + Good volume.                                                                                    | Weak & Rapid.                                                                                                                                                                                     |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| BP            | ↑ dt ↑ CA                                                                                                     | ↓ BP dt dehydration + acidosis.                                                                                                                                                                   |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| Skin          | SWEATY, PALE.                                                                                                 | DRY & INELASTIC. (dehydration)                                                                                                                                                                    |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| BREATH        | NORMAL.                                                                                                       | KUSMAUL BR. ACETONE odor.                                                                                                                                                                         |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| Pupils        | Dilated.                                                                                                      | Not-dilated.                                                                                                                                                                                      |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| TONGUE        | NORMAL.                                                                                                       | DRY (UNDER SURFACE OF TONGUE)                                                                                                                                                                     |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| URINE         | No SUGAR.                                                                                                     | +VE SUGAR & ACETONE                                                                                                                                                                               |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| IV GLUCOSE    | Rapid RECOVERY if early.                                                                                      | No effect.                                                                                                                                                                                        | <b>TTT.:</b> <ol style="list-style-type: none"> <li>1) AS DKA EXACTLY.</li> <li>2) INSULIN. "small dose" to avoid Disequilibrium \$.</li> <li>3) LMWH to Avoid ...</li> </ol>                           |                                                                                                                                                                                                                                                                                                                                                        |
| COMA          | IRRITABLE.                                                                                                    | NOT IRRITABLE.                                                                                                                                                                                    |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |
| TEMPERATURE   | NORMAL, hypo-THERMIA.                                                                                         | SUB-NORMAL.                                                                                                                                                                                       |                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                        |

## INVEST. OF DKA:

- Blood → Glucose > 300. pH < 7.25  
 ↑ Aceto-Acetic & β-OH butyric Acid.
- URINE → Glucosuria & Ketonuria.
- ECC → for hyper-kalemia.



# INVESTIGATIONS for DM

- DON'T DEPEND ON URINE GLUCOSE in DIAG. of DM due TO:**
- **Mild DM** → ↑ BS but still below Renal Threshold, (170 mg/dL)
  - ↑ **Renal Threshold:** as in Old age - long-standing DM & As → ↓ GFR  
→ ↑ BS conc. > re-absorptive capacity → +ve Glucose in urine.

## URINE "Qualitative Tests by Dipstick"

### GLUCOSURIA

"false results in  
(Vit. C - Aspirin)"

### KETONURIA

**false +ve in**  
(PREGNANCY - prolonged  
fasting - Repeated Vomiting)

### BS TESTS

"done during TTT.  
to Adjust the doses"

**FBS**  
> 126

**PP BS**  
> 200 in OGTT

**RBS**  
> 200

ON MORE THAN 1 OCCASION

## OGTT

- 1) IF border line FBS. - UNexplained  $\mu$ -VASCULAR Diabetic complications.
- 2) GESTATIONAL DM.
- 3) Abnormal OGTT.

## Blood

### Glucose

### LAB

Glycosylated  
"Glycemic control"

### Hb

*long-term Glycemic control for  
the last 6-8 wks &  
done every 3 ms  
(long LS 120 days)*

### FRUCTOSAMINE

*Short-term Glycemic control for  
2-3 wks to diff. from  
(Stress or Steroid induced  
hyperglycemia)*

### Self-MONITOR

finger-prick  
"from side of finger not tip" for  
tight metabolic control

### KB

ACETONE  
 $\beta$  OH BUTERIC A.  
replaced by pH.

| RENAL GLUCOSURIA                                                                                                                                                                                                                                          | ALIMENTARY GLUCOSURIA<br>(Lag-Storage Curve)                                                                                                                                                                                         | FLAT RESPONSE                                                                                                                          | IMPAIRED<br>GLUCOSE Tol. (IGT)                                                                                                                                                     | IMPAIRED<br>FASTING Tol. (IFG)                                                                         | GESTATIONAL DM                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>NORMAL BS + GLUCOSURIA</b><br/><i>de benign ↓ Renal Threshold for Glucose</i></p> <p><b>CAUSES of ↓ R. Threshold:</b></p> <ul style="list-style-type: none"> <li>• Pregnancy.</li> <li>• Fanconi S - RTA.</li> <li>• Heavy metal poison.</li> </ul> | <p><b>hypoglycemia</b> لما ياكل يجيله<br/><i>Early sharp rise in G. &gt; 200</i><br/>→ Renal Glucosuria but PP Glucose &lt; FBS</p> <p><b>CAUSES:</b><br/>"post-Gastroenteric late Dumping S<br/>- Thyrotoxicosis - Advanced LD"</p> | <p><b>Diff. bet. peak &amp; FBS</b><br/>&lt; 20</p> <p><b>CAUSES:</b><br/>(Mal-absorption - Insulinoma<br/>- Adrenal hypofunction)</p> | <ul style="list-style-type: none"> <li>• <b>FBS &lt; 126</b> but</li> <li>• <b>PP (140 - 199)</b></li> <li>• <b>BET. NORMAL &amp; DM + RF</b><br/><u>for DM Type II</u></li> </ul> | <ul style="list-style-type: none"> <li>• <b>FBS 100 - 125</b></li> <li>• <b>PP &lt; 140</b></li> </ul> | <p><b>1<sup>st</sup> DETECTED during pregnancy in 3<sup>rd</sup> TRIMESTER</b><br/><b>(24 - 28 wks.) &amp; limited to it. &amp; RETURN TO NORMAL AT</b><br/><b>LEAST 6 wks. FROM LABOR</b></p> <p><b>DIAGNOSIS:</b></p> <ul style="list-style-type: none"> <li>• <b>FBS &gt; 126.</b></li> <li>• <b>50 gm GLUCOSE → AFTER 1 HR. &gt; 140 - 150.</b></li> <li>• <b>3 hr. OGTT → 100 gm GLUCOSE.</b></li> </ul> |



# Insulin

## Insulin sources

endogenous from  $\beta$ -cell of

pancreas as pro-insulin"

**Insulin** = **C-peptide**  
= **Endog. Insulin**

"also  $\uparrow$  by SU"

secretion of Insulin

$\uparrow$  by

- Oral hypo-glycemics.
- Arginine AA.
- Hyper-glycemia.

$\downarrow$  by

Thiades. BB.  
PHENYTOIN.  
SOMATO-STATIN.

exogenous

**ANIMAL INSULIN**

**Beef**

3 WRONG AA

ANTIGENIC

**Pork**

1 WRONG AA

LESS  
ANTIGENIC

**HUMAN INSULIN**

**SEMI-SYNTH.**

Modified  
pork insulin

**Bio-synth.**

R-DNA.

## MECH. OF ACTION

Insulin  $\oplus$   $\alpha$ -sub-units "binding sites"

- $\Rightarrow \oplus \beta$ -subunits "traverse CM" & have Tyrosine Kinase Activity
- $\Rightarrow$  migration of GLUT4 to cell surface
- $\Rightarrow \uparrow$  G transport to cell.

## ACTIONS

**Rapid (Transport)**

$\uparrow$  G, AA - K  
Uptake by cells.

**BRIAN**  
insulin  
independent

**MS. / FAT**  
insulin  
dependent

**GRADUAL (Anabolic)**

**CHO**

$\oplus$  Glycogenises.  
 $(-)$  Gluconeogenesis.

**FAT**

$\oplus$  lipogenesis.  
 $(-)$  Ketogenesis.  
 $(-)$  Carnitine shuttle in mitochondria. Of liver.

**PROTEIN**

$\downarrow$  break down.  
AA uptake by cells.

## Insulin preparations

|                        |                               |                                         |                                                                                              |
|------------------------|-------------------------------|-----------------------------------------|----------------------------------------------------------------------------------------------|
| 1) <b>SHORT ACTING</b> | <b>REGULAR. (CRYSTALLINE)</b> | <b>NEUTRAL</b>                          | <b>SC / IV / IM &amp; Rapid ONSET</b><br><b><math>\rightarrow</math> EMERGENCIES eg DKA.</b> |
| 2) <b>INTERMEDIATE</b> | <b>NPH (HAGEDOEN)</b>         | <b>..... + PROTAMINE</b>                | <b>SC only.</b>                                                                              |
| 3) <b>LONG ACTING</b>  | <b>PZI</b>                    | <b>..... + PROTAMINE</b><br><b>+ Zn</b> | <b>SC only.</b>                                                                              |
| <b>INSULIN MIXTURE</b> | <b>Hymilin Mixtard</b>        | <b>70 % NPH</b><br><b>30% REGULAR</b>   | <b>100 UNIT / ml</b>                                                                         |

## Indications of insulin

### THERAPEUTIC USES

- 1) Type I.
- 2) Type II
  - A) After failure of (Diet / exercise / Oral Th.)
  - b) Critical times (surgery / pregnancy / Infection)
- 3) DKA - Hyper-osmolar coma.
- 4) Hyper-kalmeia

### DIAGNOSTIC USES

Hypoth. / hypoph. axis test.  
Insulin  $\oplus$  test for GH.



# complications of Insulin therapy

## special problems in DM:

- **INFECTION** → ↑ Insulin dose.
- **PREGNANCY** → # Oral hypoglycemic → fetal hypoglycemia  
Shift from single dose to multiple doses.
- **SURGERY** → ↑ Insulin dose "Regular" for tight control.

Insulin lypodyst.  
AT SITE OF inj.

change site of  
inj.

ALLERGY

URTICARIA  
ANGIOEDEMA  
ANAPHYLAXIS

- 1) Change insulin.
- 2) Anti-histamine.
- 3) Topical steroids.

ACTION

OVER TTT.

Hypo-glycemia

- 1) Oral sugar / candy ASAP.
- 2) IV G. 50% 50 ml.
- 3) IM Glucagon (1 mg) → ↑ G release then search for the vein.

pseudo-Insulin R.  
"SOMOGYI ph."

OVER TTT. & INSULIN

mild Hypo-glycemia

⊕ Anti-Insulin h.

REBOUND HYPER-glycemia

Hyperglycemia w is  
ttt. by ↓ Insulin  
dose & diet control

UNDER TTT.  
due to

INSULIN R.

"↑ Insulin Req. > 200 U/D"

**METABOLIC \$**

- 1) Obesity.
- 2) HTN as ↑ Insulin:
  - a) ⊕ Symp.
  - b) Na + H<sub>2</sub>O RETENTION.
  - c) ATHEROGENIC.
- 3) DM.
- 4) Hyper-lipidemia.

- 1) Change to human insulin.
- 2) Wt. reduction, Exercise.
- 3) ↓ fat in diet.

SALT / H<sub>2</sub>O  
RETENTION

HTN + EDEMA.

## Dawn phenomena:

- DAWN → ↑ GH SURGE  
→ hyperglycemia  
→ ↑ dose of INSULIN.

## causes of Insulin Resistance:

- PRE-Rs → Insulin Abs.
- RECEPTORS → Obesity.
- POST-Rs → failure to ⊕ TK.

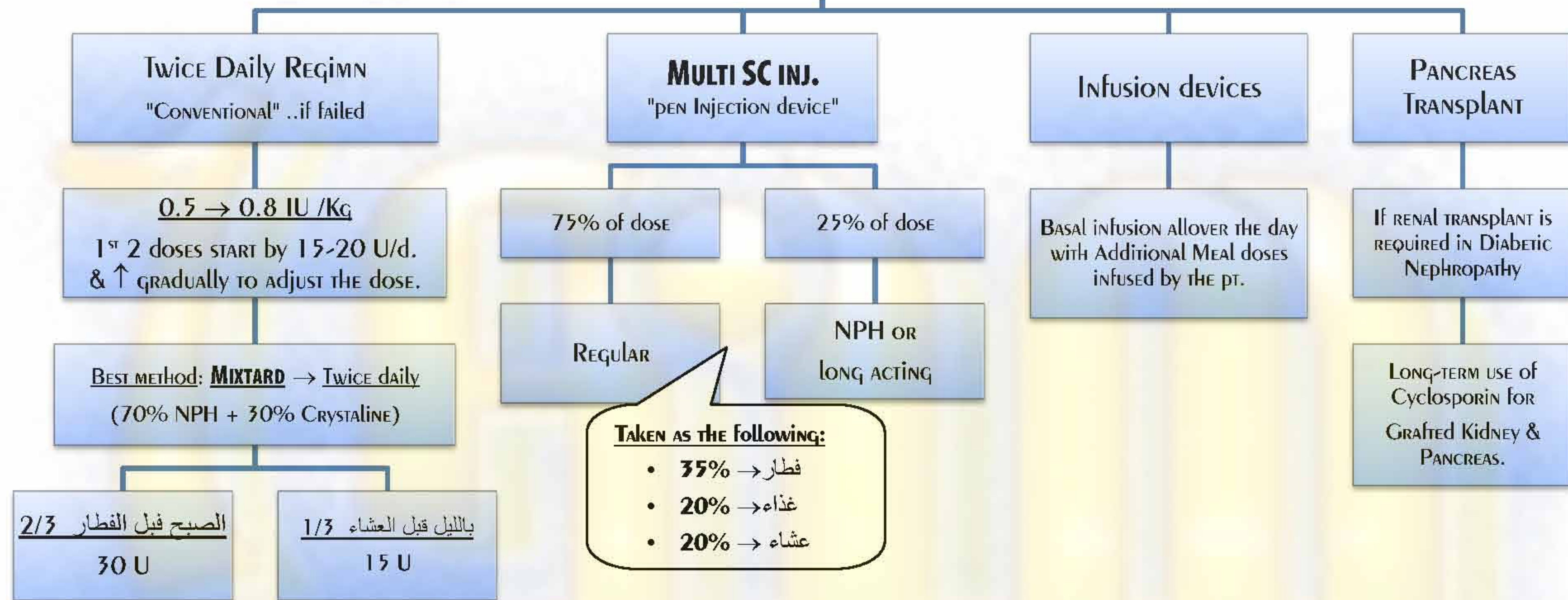


# ANTI-DIABETIC DRUGS

|                  | Hypo-Glycemics                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | EuGlycemics                                                                                                                            |                                                                                                                            |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|----------|---------------|-----------------------|-----------|------------------|---------------------------------------------------------|--------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------------------------------------------|-------------------------------------------------------------------------------------------------------|
|                  | Repaglinide                                                                                                                                                                                                       | sulphonyl urea                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Biguanides                                                                                                                             | Acarbose                                                                                                                   |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| MECH.            | As SU by ↑ Insulin Release at meal times.                                                                                                                                                                         | Insulin release from β-cell (insulin secretagogue)<br>→ ⊕ ATPase K channels<br>→ membrane depolarization.<br>→ open Ca channels → Insulin R.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1) ↓ Intestinal G. absorption.<br>2) ↑ conv. of G. to lactic A.<br>3) ↓ hepatic G output.<br>4) Insulin sensitizer.                    | Competitive (-) to α- Glucosidase<br>→ ↓ conv. of oligo to mono-saccharide<br>→ ↓ G. absorption.<br>→ ↓ PP hyper-glycemia. |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| S/E              | غالي و أهبل                                                                                                                                                                                                       | 2H + WC<br>1) Hypo-glycemia → (Glabinclamide)<br>2) HS → Allergy.<br>3) Wt. gain → insulin is anabolic.<br>4) CVS → VC & ECG changes.<br><i>Except with Glimipride, "bec. it binds to specific Rs."</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 1) Lactic acidosis esp. in liver & kidney D. → so give Rosiglitazone.<br>2) GIT upset:<br>• Metallic taste.<br>• Dyspepsia - Diarrhea. | 1) Abd. Distention<br>2) Flatulence.<br>3) Diarrhea.                                                                       |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| USES             | TYPE II                                                                                                                                                                                                           | TYPE II ONLY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | TYPE 1 & 2                                                                                                                             | with SU who CAN'T TOLERATE Biguanides                                                                                      |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| Eq.              | Rosiglitazone: (Glustin®)<br>1) Insulin sensitizer.<br>(PPAR-γsub-unit)<br>2) ↓ hepatic G output.<br>3) As Biguanides but<br>doesn't cause LA → so used in liver & renal D.                                       | <div><div>1<sup>st</sup> GEN.<br/>"Tolbutamine"</div><div>2<sup>nd</sup> GEN.<br/>"SEE below"</div><div>NOT POTENT<br/>→ easily displaced from PP<br/>→ MANY DRUG INTERACTIONS.</div><div>150 X POTENT<br/>→ ↓ disp. from PP<br/>→ LESS DRUG INTERACTIONS</div></div> <table><tr><td>1) Glipizide</td><td>SHORT ACTING.</td><td>Minidiab</td></tr><tr><td>2) Gliclazide</td><td>INTERMEDIATE. "Good."</td><td>DIAMICRON</td></tr><tr><td>3) Glabinclamide</td><td>LONG ACTING. "Bad" → hypoglycemia in liver or kidney D.</td><td>DOANIL</td></tr><tr><td>4) Glimipride</td><td>bind to specific Rs. → No CVS S/E.<br/>1) On/ Off mech.<br/>• Rapid insulin release → ↓ PP hyper-glycemia.<br/>• Rapid shutdown → ↓ risk of hypo-glycemia<br/>2) Long duration (24 hr.) → Given once/day → Good comp.</td><td>AMARYL</td></tr></table> | 1) Glipizide                                                                                                                           | SHORT ACTING.                                                                                                              | Minidiab | 2) Gliclazide | INTERMEDIATE. "Good." | DIAMICRON | 3) Glabinclamide | LONG ACTING. "Bad" → hypoglycemia in liver or kidney D. | DOANIL | 4) Glimipride | bind to specific Rs. → No CVS S/E.<br>1) On/ Off mech.<br>• Rapid insulin release → ↓ PP hyper-glycemia.<br>• Rapid shutdown → ↓ risk of hypo-glycemia<br>2) Long duration (24 hr.) → Given once/day → Good comp. | AMARYL | Metformin =<br>Cidophage® or Glucophage® | 1) ↓ PP hyper-glycemia.<br>2) No hypo-glycemia / no wt. gain.<br>3) ↓ insulin R.<br><br>Eq. Glucobay® |
| 1) Glipizide     | SHORT ACTING.                                                                                                                                                                                                     | Minidiab                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                        |                                                                                                                            |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| 2) Gliclazide    | INTERMEDIATE. "Good."                                                                                                                                                                                             | DIAMICRON                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                        |                                                                                                                            |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| 3) Glabinclamide | LONG ACTING. "Bad" → hypoglycemia in liver or kidney D.                                                                                                                                                           | DOANIL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                        |                                                                                                                            |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |
| 4) Glimipride    | bind to specific Rs. → No CVS S/E.<br>1) On/ Off mech.<br>• Rapid insulin release → ↓ PP hyper-glycemia.<br>• Rapid shutdown → ↓ risk of hypo-glycemia<br>2) Long duration (24 hr.) → Given once/day → Good comp. | AMARYL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                        |                                                                                                                            |          |               |                       |           |                  |                                                         |        |               |                                                                                                                                                                                                                   |        |                                          |                                                                                                       |



# Insulin Therapy in Type I



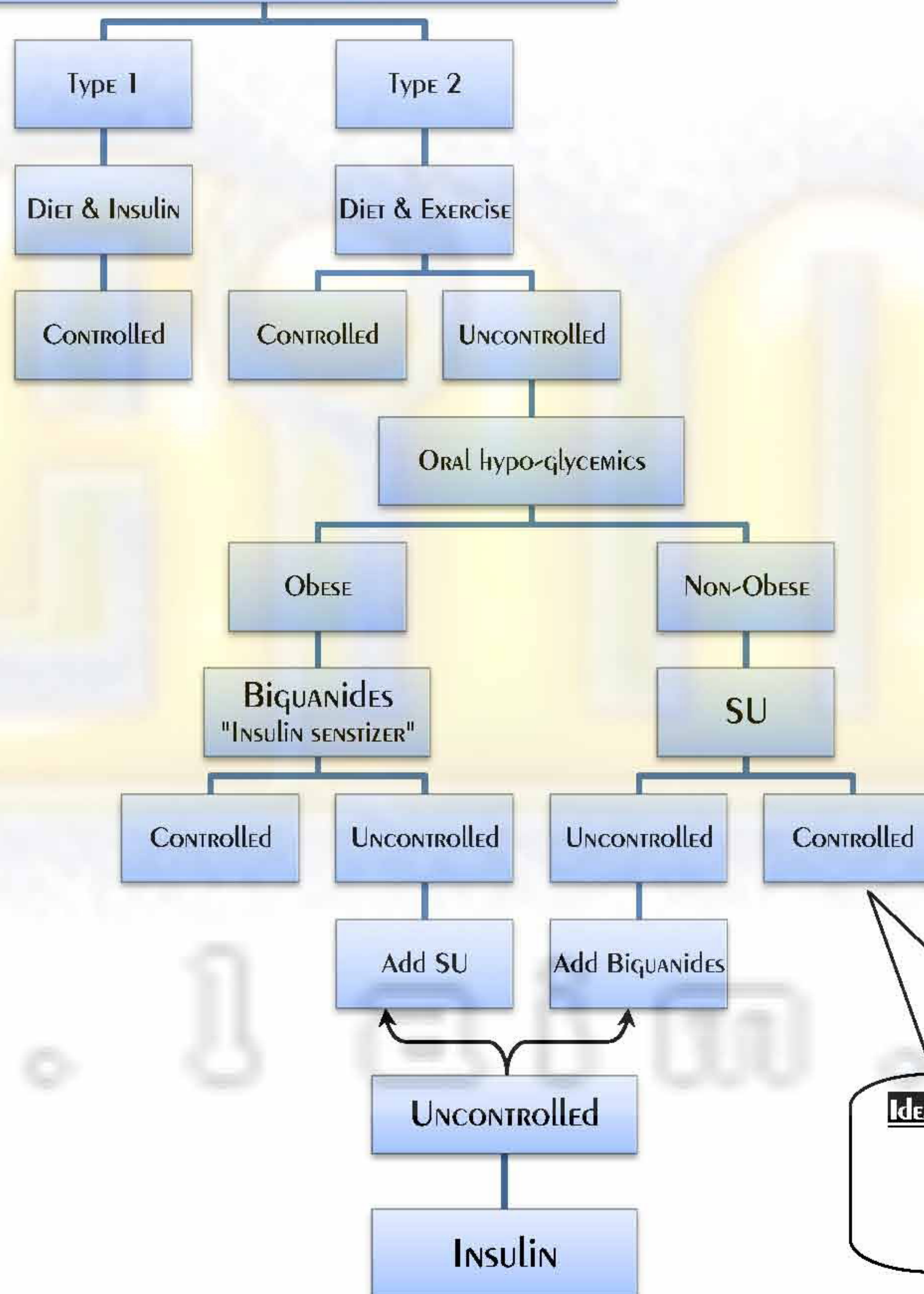
## TREATMENT OF DM

|              | Type I                                                                               | Type II                                                                                                            |
|--------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Diet</b>  | 1) M...36 Kcal / kg<br>2) F...34 Kcal/kg.<br>3) Non-nutritive sweeteners. "candril". | <b>Obese: Metabolic S</b><br>Wt. reduction – Exercise - ↓ fat in diet.                                             |
| <b>PREV.</b> | 1) Neonatal → CM deprivation.<br>2) Imm. Supp. → Cyclosporins.<br>3) Anti-oxidant.   | 1) Diet control after 30 ys.<br>2) Metformine → Insulin sensitizer.<br>3) ACEI → ↓ Insulin R.<br>4) Anti-oxidants. |



# TREATMENT pathway for DM

"New patient"



## Ideal Goals for Glycemic Control:

- FBS → 90-130
- PP → < 180.
- Glycosylated Hb < 7%.



# BRITTLE DIABETES

---

*“Unpredictable fluctuations of blood glucose  $\pm$  ketoacidosis  $\pm$  recurrent hypoglycaemic episodes”*

## **MANAGEMENT OF BRITTLE DIABETES:**

- 1) Hospitalization.
- 2) Insulin “Regular” at regular interval e.g every 6 hours.
- 3) Insulin pump.
- 4) Treatment of cause.

## CAUSES OF RECURRENT HYPOGLYCEMIA

---

- 1) Over treatment with insulin.
- 2) Low renal threshold for glucose.
- 3) Endocrine causes e.g pituitary or adrenal insufficiency.
- 4) Gastroparesis due to autonomic neuropathy  $\rightarrow$  early satiety so Add Motilium b4 meal by 1 hr.
- 5) Renal failure.
- 6) Uncooperative, unintelligent patient.

## CAUSES OF RECURRENT KETO-ACIDOSIS

---

- Inappropriate insulin combinations.
- Inter-current illness e.g unsuspected infections.
- Unknown etiology.

## CAUSES OF RECURRENT HYPERGLYCEMIA

---

*As ketoacidosis + somogyi + dawn phenomena.*



# HYPOGLYCEMIA

## TRIAD ⇒ WHIPPLE'S TRIAD FOR DIAGNOSIS:

- 1) ↓BS < 45-50 mg/dl.
- 2) Manifest. Of hypoglycemia.
- 3) IV Glucose ⇒ Good response.

## TYPES OF HYPOGLYCEMIA

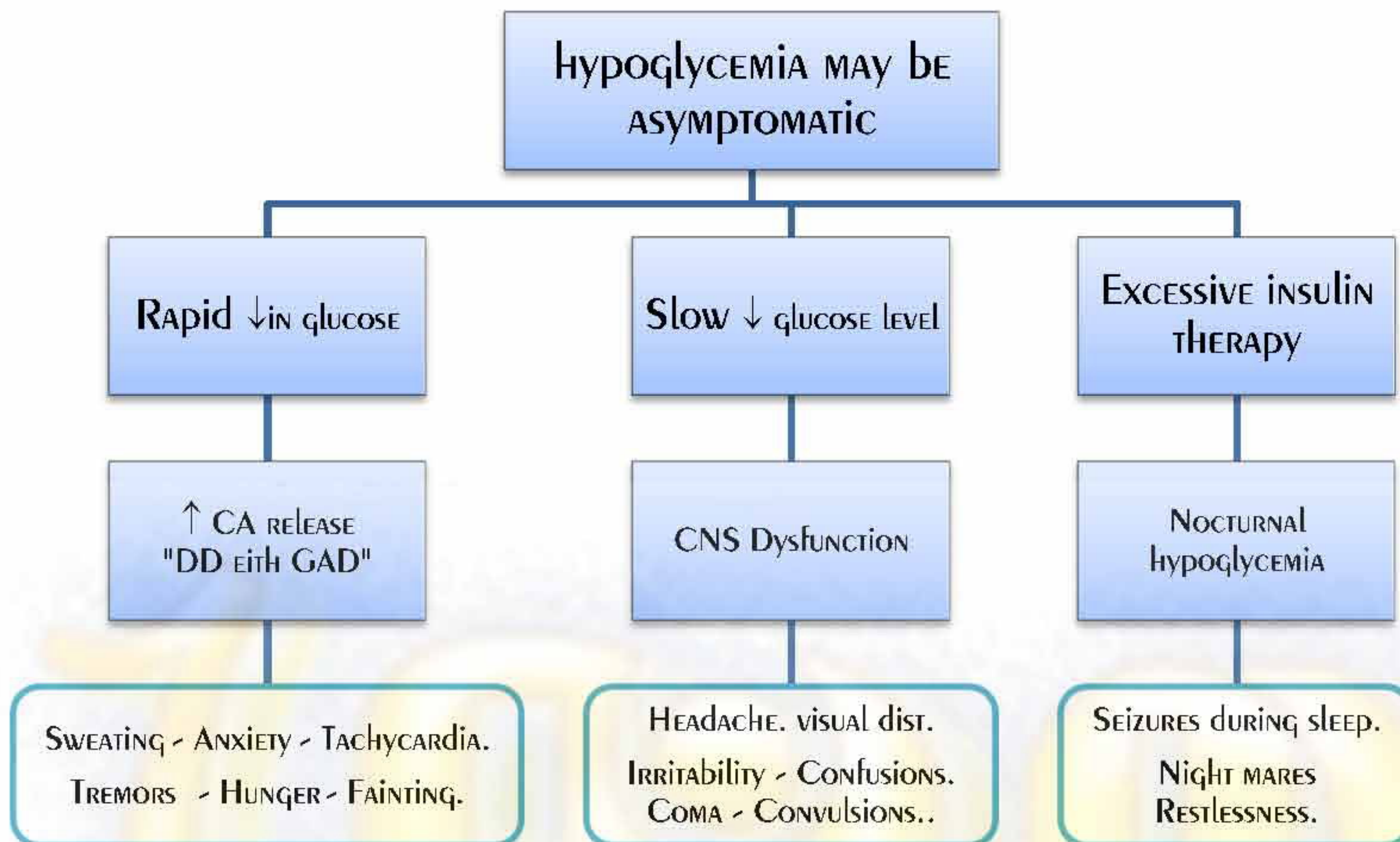
| FASTING Hypoglycemia                                                                                                                                                                                                                                                                                                                     | POSTPRANDIAL hypoglycemia                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• <b>TUMOR</b> = <b>Insulinoma</b>, hepatoma.</li> <li>• <b>SEVER illness</b> = LCF, CRF, anorexia nervosa.</li> <li>• <b>DRUGS:</b> <b>Insulin, Oral hypoglycemic.</b></li> <li>• <b>↓↓ HORMONAL:</b> <b>GH, Epinephrine, Cortisol.</b><br/><b>(Addison's D / Panhypopituitarism)</b></li> </ul> | <ul style="list-style-type: none"> <li>• <b>ALIMENTARY hypoglycemia</b><br/>eg. Dumping \$ after gastric surgery.</li> <li>• <b>FUNCTIONAL hypoglycemia.</b></li> <li>• <b>REACTIVE hypoglycemia</b> dt ↑↑ insulin after CHO diet.</li> <li>• <b>GALACTOSEMIA, FRUCTOSE INTOL., ETHANOL.</b></li> </ul> |

## IMPORTANT CAUSES OF HYPOGLYCEMIA

| INSULINOMA                                                                                                           | INSULIN THERAPY                                                                                                          | ORAL hypoglycemic<br>SU NO BIQUANIDES                                                                           | POSTPRANDIAL Hypoglycemia                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• HYPO-GLYCEMIA.</li> <li>• ↑ INSULIN +</li> <li>• ↑ C PEPTIDE.</li> </ul>    | <ol style="list-style-type: none"> <li>1) HYPO-GLYCEMIA.</li> <li>2) ↑ INSULIN &amp;</li> <li>3) ↓ C PEPTIDE.</li> </ol> | <ul style="list-style-type: none"> <li>• HYPO-GLYCEMIA</li> <li>• ↑ INSULIN.</li> <li>• ↑ C PEPTIDE.</li> </ul> | <b><u>AFTER GASTRECTOMY</u></b><br>→ rapid glucose absorption<br>→ ↑ insulin, glucose metabolized rapidly but insulin remain ↑↑<br>→ hypoglycemia 1-2 hours PP. |
| <ul style="list-style-type: none"> <li>• CT SCAN, ANGIOGRAPHY.</li> </ul>                                            |                                                                                                                          | SEARCH FOR HYPOGLYCEMICS IN BLOOD OR URINE.                                                                     |                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>• SURGICAL REMOVAL</li> <li>• (-) INSULIN = DIAZOXIDE, OCTREOTIDE.</li> </ul> |                                                                                                                          |                                                                                                                 | <b>TTT.</b> → FREQUENT SMALL MEALS.<br>(↓CHO & ↑ PROTEIN)                                                                                                       |



# CL./P OF HYPOGLYCEMIA



## GRADES OF HYPOGLYCEMIA:

- **Mild:** aware of hypoglycemia, & **can** treat himself.
- **Moderate:** aware of hypoglycemia, & **can't** treat himself.
- **Severe:** Coma. recovery by IV glucose or glucagon SC or IM.

## TREATMENT OF SEVERE HYPO-GLYCEMIA

- Glucose 25% then 10% infusion. Glucagon 1mg IM or SC.
- Then → 10% of glucose to keep the glucose level > 100 mg/dl.
- Mild to moderate cases ⇒ oral glucose or, sucrose or 100 ml. of sweet drink

## CAUSES OF HYPOGLYCEMIA IN PT. TAKING INSULIN OR SU?

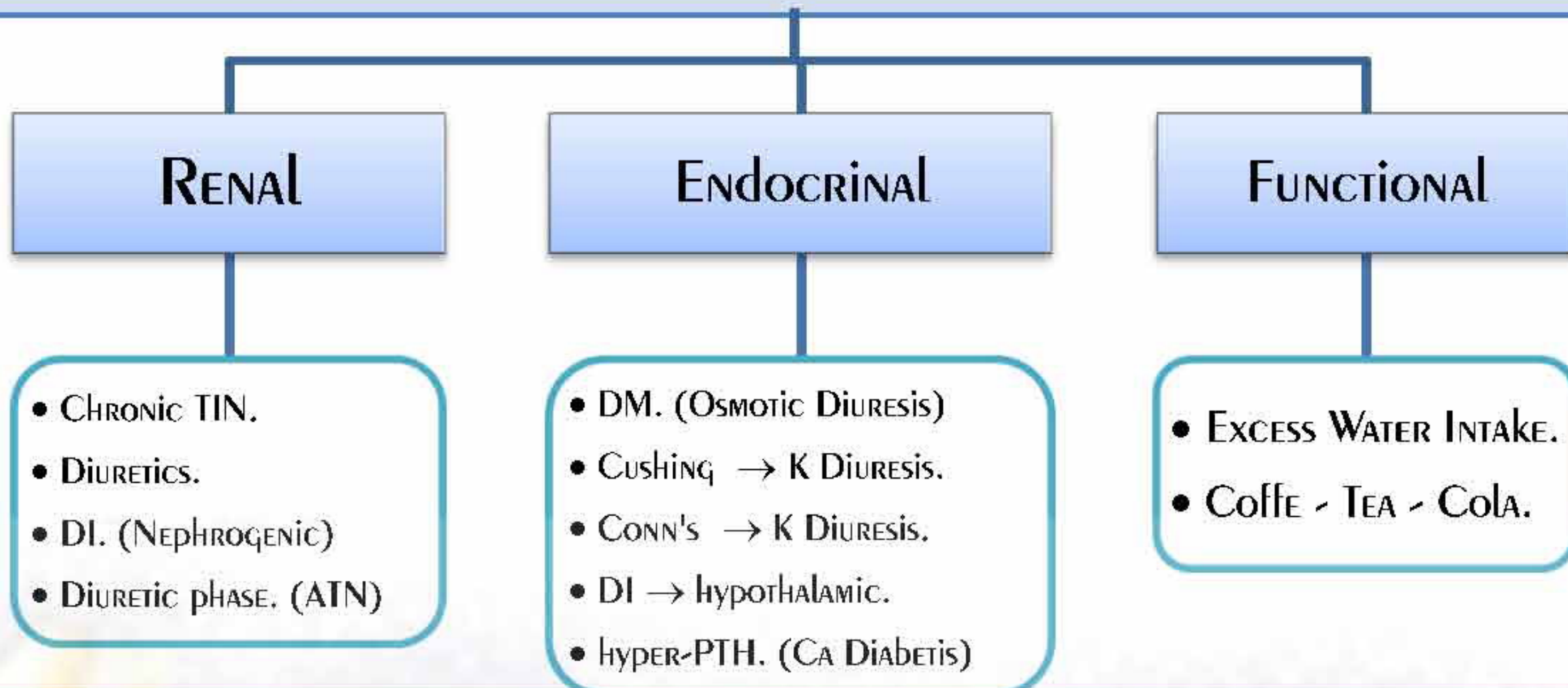
- Missed, delayed or inadequate diet.
- Errors in doses or schedule
- Gastroparesis (autonomic neuropathy).
- Other endocrine disorder e.g Addison's disease
- Factitious.
- Unexpected or unusual exercise
- Poorly designed insulin regimen.
- Mal-absorption or dumping.



# Important Notes in ENDOCRINE

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## DD of polyuria



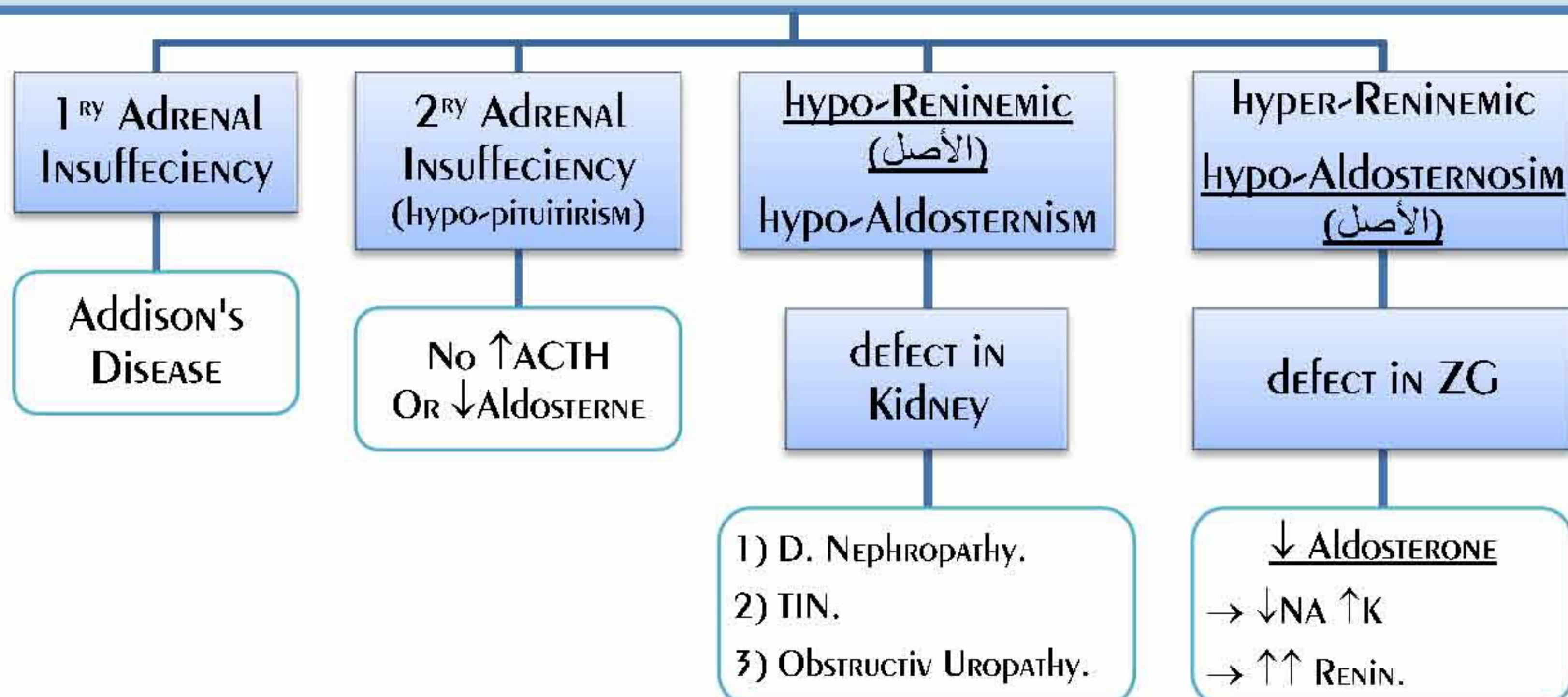
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## MYXEDEMA COMA

| CL./P                                                                                     | TTT.                                       |
|-------------------------------------------------------------------------------------------|--------------------------------------------|
| <u>CONFUSION &amp; COMA</u><br><u>STRESS CONDITIONS</u><br>(s. cold – INFECTION – TRAUMA) | → IV Hydro-CORTISONE + IV fluids.          |
| • ↓↓ THYROID H.                                                                           | → IV Tri-iodo-THYRONINE & ↑ DOSE gradually |
| <u>4 H:</u>                                                                               |                                            |
| • <u>H</u> YPO-THERMIA → VF                                                               | → HOT bags.                                |
| • <u>H</u> YPO-GLYCEMIA                                                                   | → GLUCOSE INFUSION.                        |
| • <u>H</u> YPO-VENTILATION                                                                | → O <sub>2</sub> Th. + VENTILATOR.         |
| • <u>H</u> EART - LIVER - KIDNEY IMPAIRM.                                                 |                                            |

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## CAUSES OF Hypo-Aldosteronism





**ACUTE ADRENAL FAILURE due to**

| CAUSES                                  |                                                                                                     |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------|
| a) Addisonian Crisis                    | STRESS eg. OPERATION, TRAUMA – INFECTIONS Addison's D.                                              |
| b) Sudden Withdrawal of high dose of CS | dt (-) of ACTH → so gradual withdrawal to allow the regain of ACTH secretion (so ↓10% of dose /wk.) |
| c) Waterhouse Friderichson S            | Meningococcal or pseudomonas septicemia → Adrenal hge.                                              |
| d) Anti-Coagulant Th.                   | → Bilat. Adrenal hge.                                                                               |
| CL./P                                   |                                                                                                     |
| <b>Exaggeration Of Addison's D.:</b>    |                                                                                                     |
| 1) SEVER hypotension → COMA OR Shock.   |                                                                                                     |
| 2) SEVER ASTHENIA.                      |                                                                                                     |
| ➤ INVEST.                               | as Addison's D.                                                                                     |
| ➤ TREATMENT                             | 1) Saline + IV hydrocortisone (100 mg)<br>2) Hypo-glycemia → Glucose.                               |

**DD OF Hyper-pigmentation:**

- |                       |                     |
|-----------------------|---------------------|
| 1) Cushing D. (↓ACTH) | 4) SUN Exposure.    |
| 2) Familial.          | 5) HEMOCHROMATOSIS. |
| 3) OCP & PREGNANCY.   | 6) Addison's D.     |

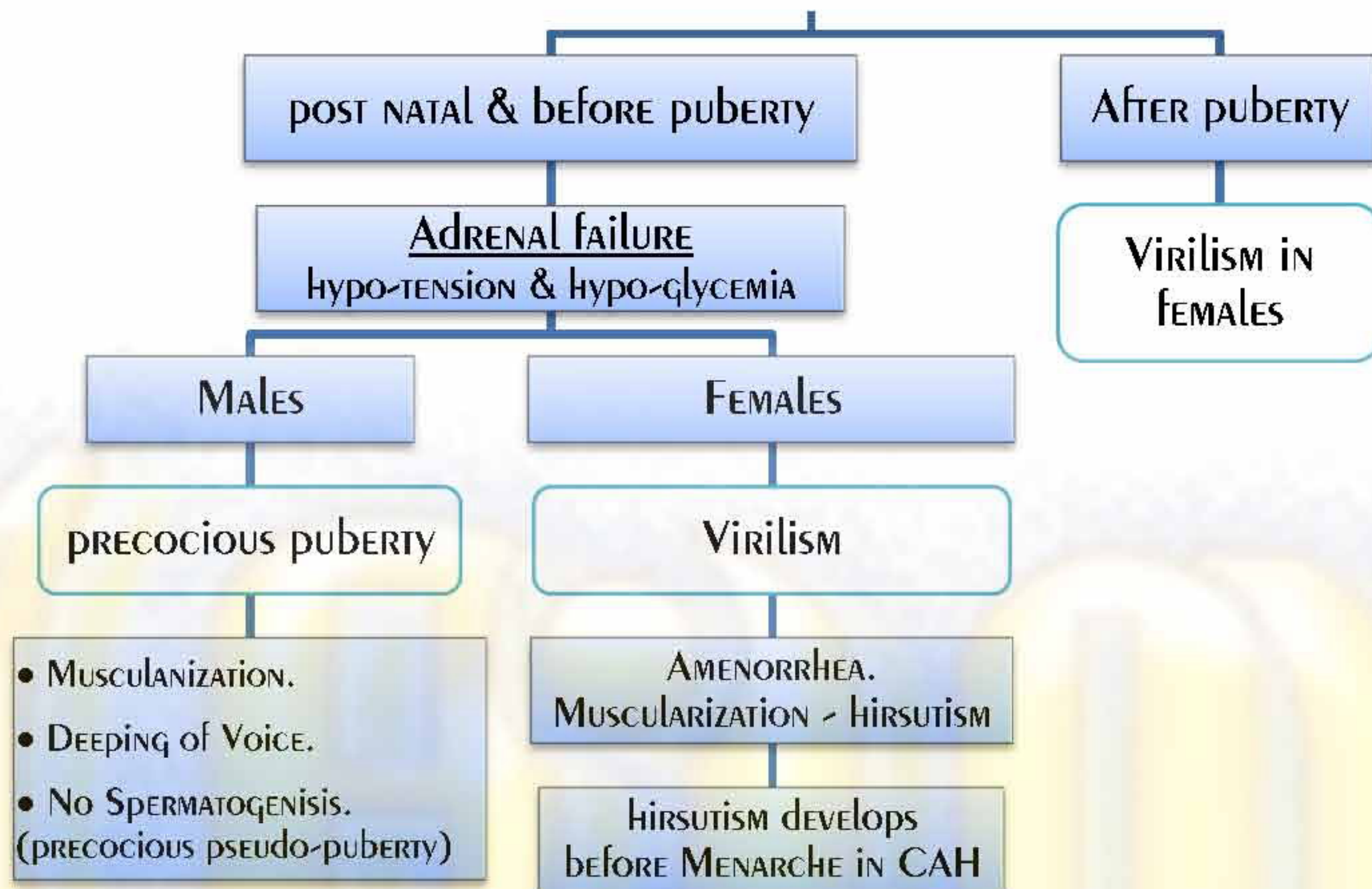


## CONGENITAL ADRENAL HYPERPLASIA (CAH)

• **AR = ENZYMATIC defect in the Cortisol synthesis pathway** *dr* ( $\downarrow$  21 or 11 Hydroxylase or 11 E.)

• ( $\downarrow$  Cortisol  $\rightarrow$   $\uparrow$  ACTH  $\rightarrow$  shift of steroid precursors to Androgenic H. pathway)

### CL./P OF CAH



## CAUSES OF **Hyper-Aldosteronism**

